# THE JOURNAL OF GAS LIGHTING
## WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVII. No. 1711.] LONDON, FEBRUARY 25, 1896. [48TH YEAR. PRICE 6d.



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OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

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OF SUPERIOR QUALITY

**FOR GAS-FURNACES.**

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These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

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Strongly recommended where EXCESSIVE HEATS have to be maintained.

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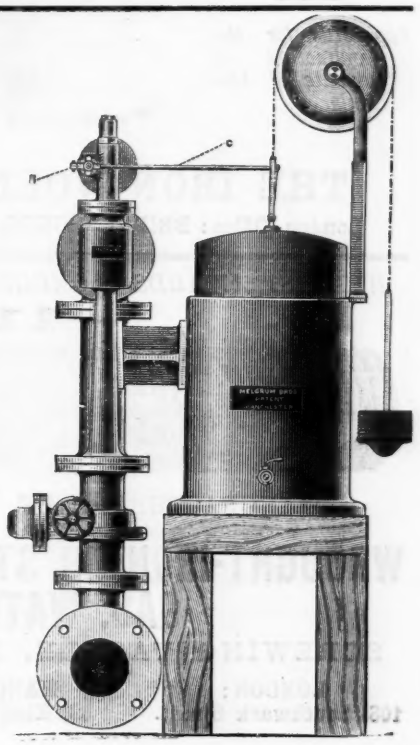

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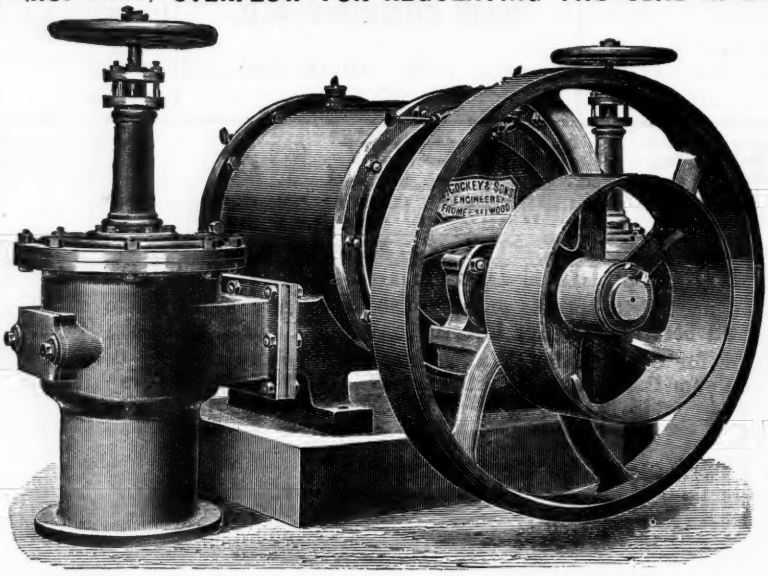


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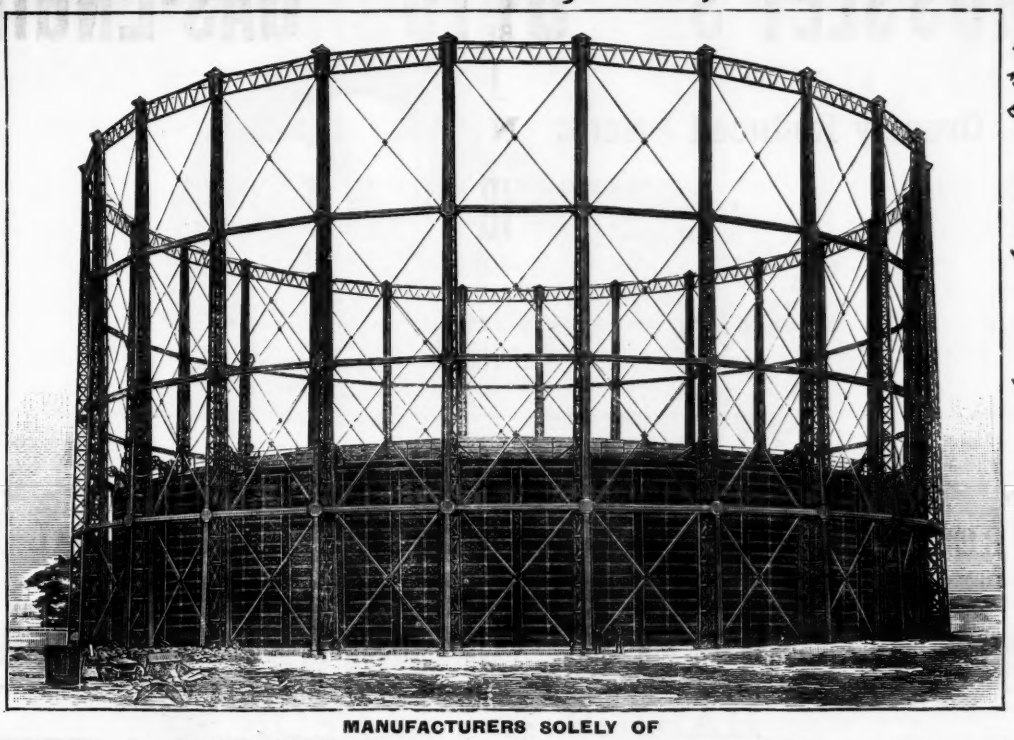

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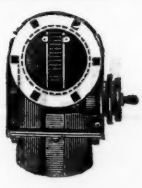

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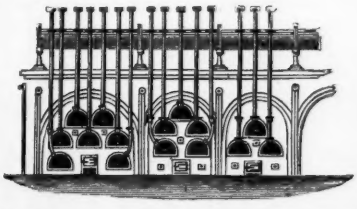

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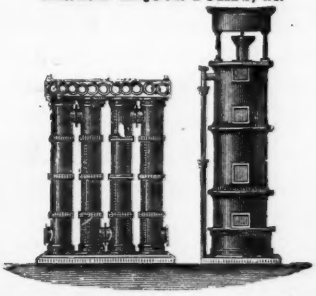

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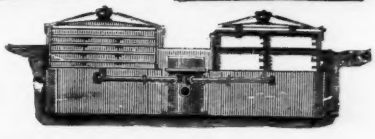

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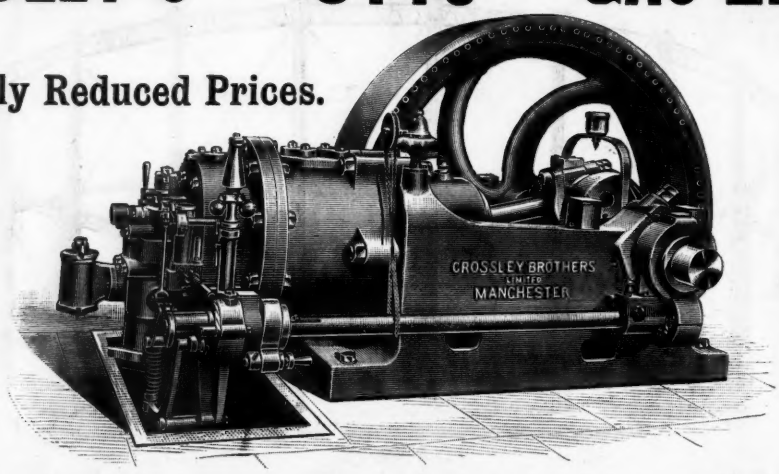


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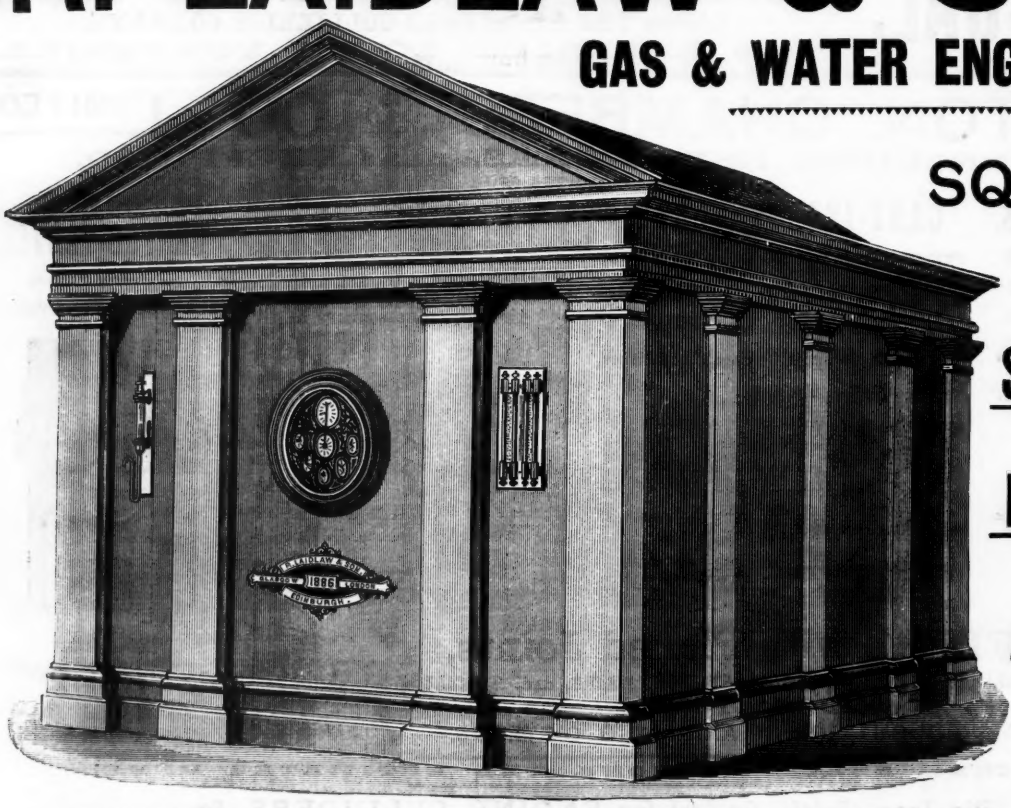


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## The Great Reduction in Prices,

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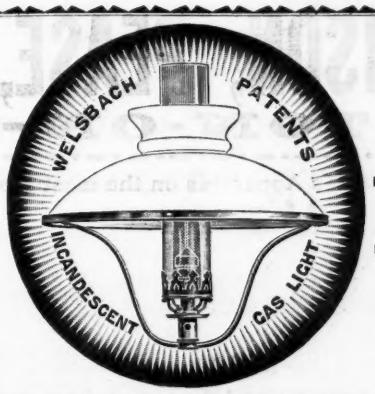
**Places this highly popular Light within the means of all classes**

**The greatly Reduced Consumption of Gas**

**COVERS THE INITIAL COST OF THE BURNERS IN FROM SIX TO EIGHT MONTHS.**




**The PRICES have been REDUCED as follows:—**

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**Prices of other Patterns reduced proportionately.**

**SPECIAL ATTENTION IS CALLED TO**

## THE "S" BYE-PASS BURNER,

**Which, with a Consumption of 2¼ Cubic Feet of Gas an hour, gives a light of 25 to 30 Candle Power.**

**This Pattern is particularly recommended where it is desired to effect a large saving in Gas rather than to effect a great increase in the Light.**

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**GREATLY REDUCED HEAT.**

The *Lancet* Special Analytical and Sanitary Commission, in an exhaustive report, pronounces the Incandescent Gas-Light System to be the Healthiest, Best, and most Economical System of Gas Lighting.

**SUITABLE FOR EVERY PURPOSE OF INSIDE OR OUTSIDE LIGHTING.**

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# MASON'S GAS-PRODUCER

[PATENT 7467-93.]

This System is the "**only**" one which works **CONTINUOUSLY**. There are no Clinkers formed, consequently a constant and regular volume of gas is maintained. Labour is **considerably reduced**, one man being able to attend to **8 PRODUCERS**. Clinkering being dispensed with, there is a saving in Fuel of quite **10 PER CENT**. A bright clear gas is obtained from **COKE BREEZE**, which can be used for heating **RETORT-BENCHES**, and every description of **FURNACE** and **KILN**.

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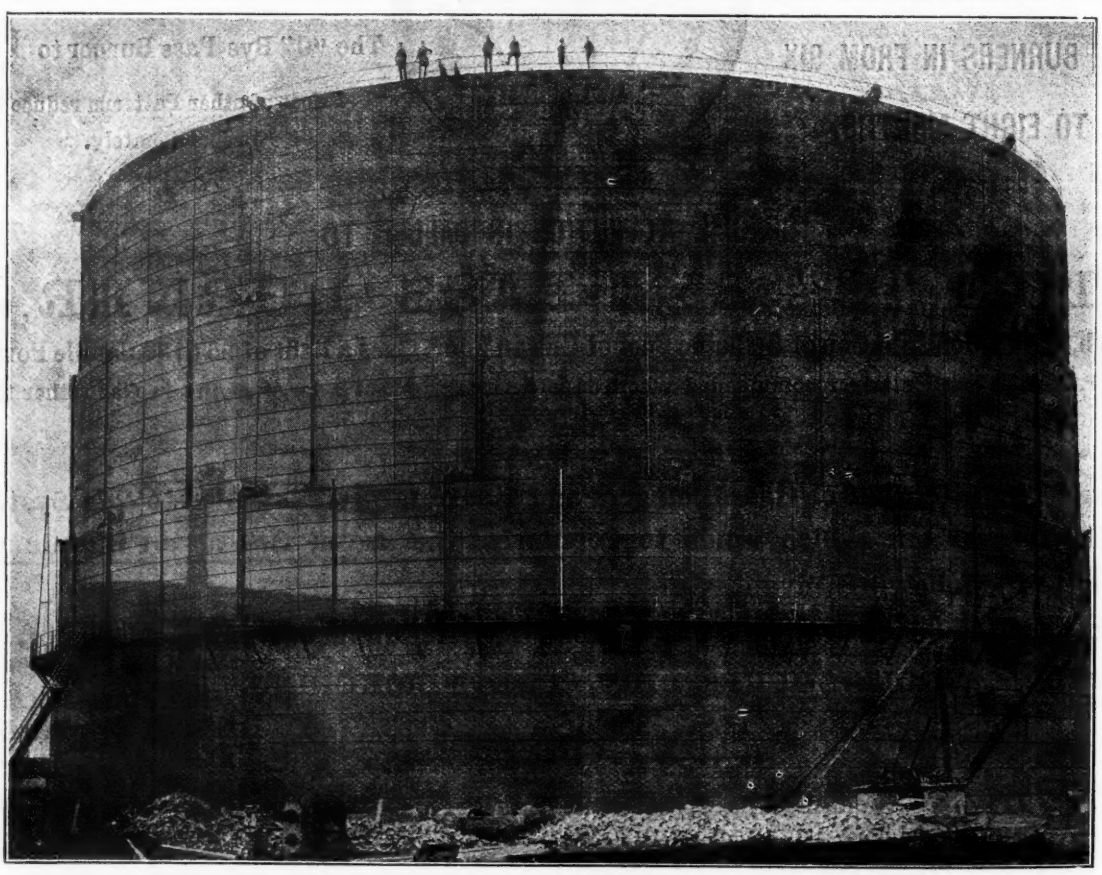
**Makers of EVERY Description of Gas Apparatus on the most Modern and Approved Principles.**

WIRE ROPES.



WIRE ROPES.

**From Photograph of Middlesbrough Gasholder. Three Lifts, 30 ft. deep each; Tank, 186 ft. 6 in. diameter, by 31 ft. deep. Capacity 2,250,000 Cubic Feet.**

**By far the largest Columnless Holder in existence.**

Engineers and others visiting any of the following places should not fail to examine these most interesting examples of Engineering, illustrating modern practice in Gasholder Construction. Particulars may be obtained on application to the SOLE MAKERS and Inventors, ASHMORE, BENSON, PEASE, & Co., Limited.

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**Manchester (Rochdale Road, 1 Holder).**
**do. (Gaythorn Works, 3 Holders).**
**Darlington.**
**Middlesbrough (see Illustration).**
**Selby.**
**Sligo.**
**Milan (Italy).**
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**References to American and other Users.**

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# Improvements in Sulphate of Ammonia Apparatus

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SEVERAL PLANTS ARE ERECTED, AND GIVING MOST SATISFACTORY RESULTS.

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The Cost of Taking Down, Cleaning, and Re-erection has been reduced by more than 75 per cent.

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"I can now obtain **60** Tons of Sulphate of Ammonia per week with 'Colson's' Still, using ONE Boiler, whereas, with my former continuous plant, TWO Boilers were required to produce **40** Tons per week."

For Prices and Particulars, apply to the Sole Makers—

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## FOR ENRICHING GAS IN BULK.

**Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching**

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WHICH HAS BEEN FITTED TO MANY OF THE LARGEST GASHOLDERS IN LONDON AND THE PROVINCES, AND IN AUSTRIA, GERMANY, DENMARK, AND THE UNITED STATES.

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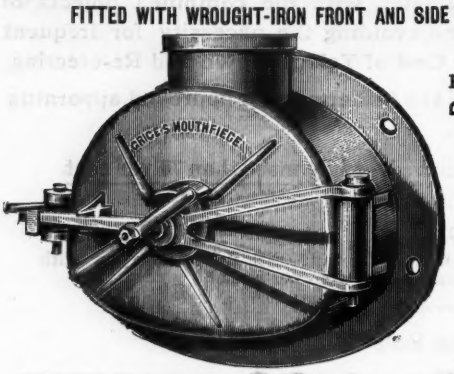
FITTED WITH WROUGHT-IRON FRONT AND SIDE LEVERS.




Patterns for Oval, ⌂, and Rounds, or all sized Retorts.

*Catalogue and Price on application.*

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PATENT

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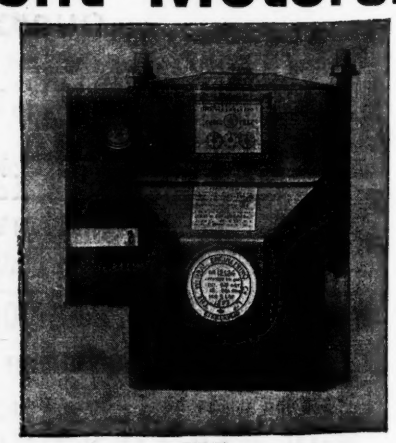
**Simple! Positive!! Accurate!!!**

**The only Prepayment Meter with no Springs, Counter-Balance Weights, or Frictional Gearing to get out of order.**



DRY.

**Particulars on Application to the COMPANY, 76, Hamilton Street, BIRKENHEAD.**

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## PATENT "STANDARD" WASHER-SCRUBBER

**504 of these Machines (capable of dealing with 491,150,000 cubic feet of gas per day) in use and in course of construction, which fact is given as evidence of this apparatus being the most efficient of any in the Market for the Extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.**

## MARSHALL'S PATENT BATTERY CONDENSER & SCRUBBER.

This Apparatus being made in Sections, the Capacity can be easily and cheaply increased as required. Other advantages are: Large and Effective Cooling Area on small Ground Space; Slow Speed; no Repairs required; High Strength Liquor obtained; and Easy Control.

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(*Vide* JOURNAL OF GAS LIGHTING, *May* 22, 1894.)

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**Extracts practically all the Tar, and, experience proves, keeps clean and free from choking up. In use at Ilford, Antwerp, Copenhagen, &c., &c.**

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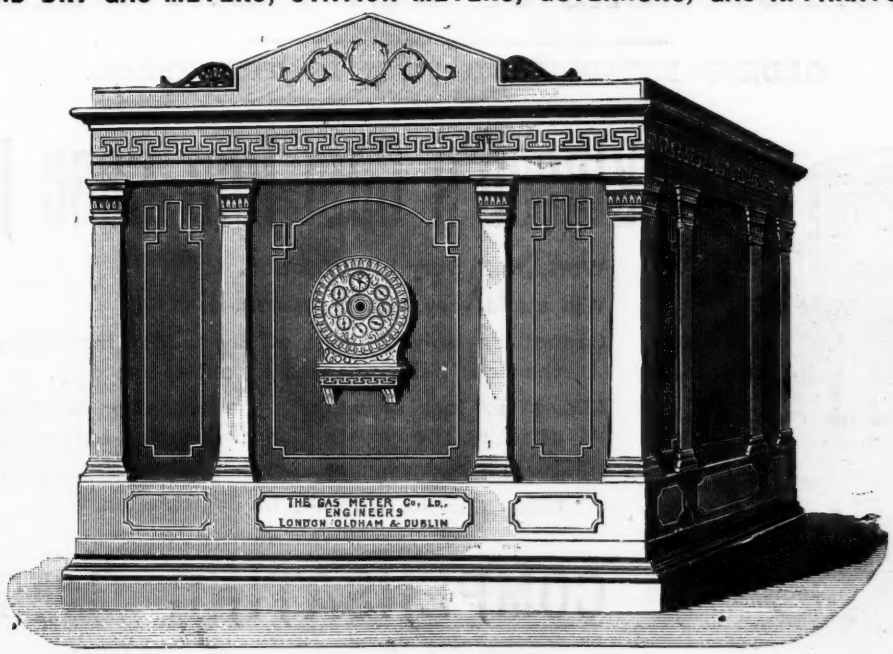
SQUARE STATION METERS WITH PLANED JOINTS.

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DESIGN No. 2 PATTERN.

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[See Advertisement on back of Wrapper.

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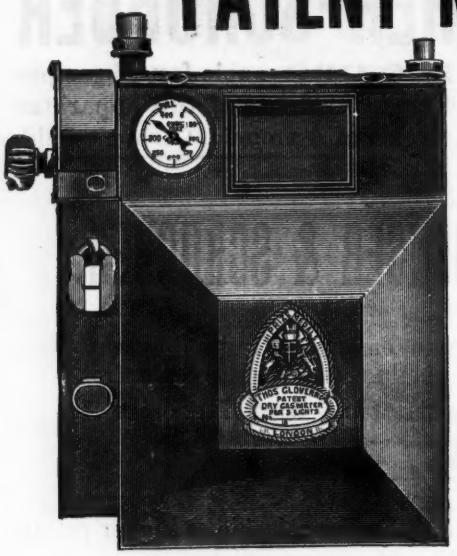
# PATENT NEW IMPROVED PREPAYMENT METER



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**Positive in Results.**
**Price Changer *in Situ.***

**GUARANTEED FOR FIVE YEARS.**

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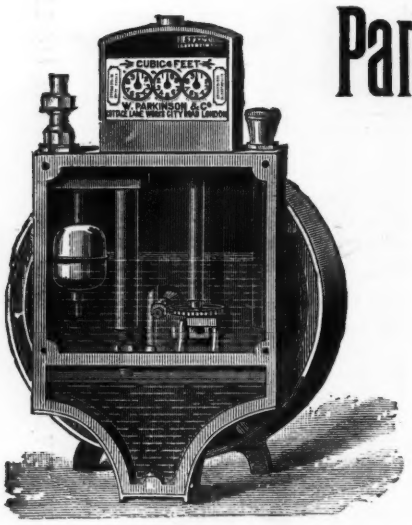


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[See also Advt. p. 436.

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# EDITORIAL NOTES.

### The Southern District and Midland Meetings.

THE Southern District and Midland Associations of Gas Managers met on Thursday last; and the Inaugural Addresses of both incoming Presidents will be found in another part of the present issue of the "JOURNAL." Mr. A. F. Browne, who succeeds Mr. S. W. Durkin in the chair of the Southern Association, gave his supporters a long and closely-reasoned discourse, into which a good deal of original observation is packed. Mr. Browne's criticism of the coal-conveying arrangements of some retort-houses is just; and his remarks upon the "spurious fractional "distillation" that goes on in a retort charged in the ordinary way are much to the point. It is to be hoped that his wish to have the results of carbonization in bulk further investigated will be gratified. It must naturally be echoed in this column, since it was the suggestions of the "JOURNAL" on the subject that prompted the speaker's aspiration. Mr. Browne's ponderings on the qualities and quantity of the vapours which exist in purified gas are deserving of careful consideration. He has been experimenting at Rotherhithe, and watching very closely the results of carburetting his output on the full scale, till he has arrived at the tentative conclusion that the luminosity of gas produced from Newcastle coal is largely dependent upon the quantity of naphthalene vapour retained in it by the solvent action of other and lighter accompanying hydrocarbon vapours. The conclusion is not exactly a fresh one. But Mr. Browne is a great hand at testing everything in and about gas manufacture by full-sized experiments; and his hypotheses, arrived at by this road, are always worthy of respect. What Mr. Browne seems to have been driving at is enrichment of gas, not so much by putting luminosity into it, as by preventing the native luminosity due to naphthalene from being thrown down and lost. With this view, he has a preference for such enrichers, so called, as have most affinity for naphthalene, chief among them being oil gas. He suggests that oil gas should be tried upon naphthalene-laden gas—as that from Newcastle coal—by admixture at the point where naphthalene chiefly deposits itself. It is a simple request, which should be very easy of fulfilment. Altogether, Mr. Browne's address must be qualified as an extremely creditable exercise in technical suggestion and criticism; and the Association are to be congratulated upon having received such a valuable contribution to their Transactions.

Mr. W. R. Cooper's address to the Midland Association is to be mentioned here with caution, lest we should be misunderstood as wishing to compare the presidential utterances of the two gentlemen whom the Fates compelled to "orate" simultaneously in Birmingham and in London. Nothing can be farther from our intention; and it is rather to be regretted that the exigencies of time and space require both addresses to be published together. It is hard enough for any gas manager to be called upon to fill the chair of a technical society and prepare an address, as it were to order, without the additional infliction of risk of comparative criticism. Mr. Cooper is a gas manager who enjoys in a high degree the respect and regard of his fellows; and his address was very suitable indeed to the occasion and to the audience. In many parts it reads like a "pendant" to Mr. Browne's production; and it bears ample evidence that knowledge of the correct principles of gas manufacture is at the service of the gas consumers of Banbury, as well as in South London.

### Mr. Livesey on Unaccounted-for Gas.

THE meeting of the Crystal Palace District Gas Company, reported in another column, afforded the Chairman (Mr. George Livesey) an opportunity for again discussing the London and suburban trade in gas residuals in the light of accomplished facts. This particular undertaking, like all others, has suffered from the depreciated value of coke and sulphate of ammonia; and the Chairman had to tell the proprietors how great was the falling off in revenue from these two sources, and to what causes it was to be attributed. Since the Company were able to obtain their coal at a reduced price, however, they have not been injured so much as they would have been if the alteration in market rates had been all on one side. A portion of the Chairman's speech was devoted to the always interesting—and in the case of this Company sometimes acute—

question as to the proportion of unaccounted-for gas. On the face of the accounts, this proportion in the Crystal Palace district stands at 9·4 per cent. of the make, which is undesirably high for any well-equipped modern gas undertaking. To the question of what this figure means, the Chairman brought his own technical knowledge, and the valuable aid of Mr. Glaisher's meteorological science. To the latter is due the useful generalization that the average temperature of the atmosphere of a place —of course, only in the United Kingdom—is the same in degrees of the Fahrenheit thermometer as its degrees of latitude. This is a very simple statement; but we do not remember ever meeting with it before. Anyhow, as Mr. Livesey says, it is a piece of information worth knowing. It bears very directly upon the point of how far the readings of a station meter should in fairness be corrected for temperature to arrive at the true measurement of the quantity. Dealing with the disturbing effect of atmospheric temperature upon the volume of gas distributed and measured by a large number of consumers' meters, Mr. Livesey thought the best way of getting at the truth was to take the temperature of the air and the gas at the station meter every three hours, and correct the volume to that corresponding to a temperature "a little above" the former, to allow for the effect of the shelter in which the consumers' meters usually stand. A degree or two does not make any very great difference; but the questions suggested by this observation of Mr. Livesey's are: What allowance should be made in the procedure laid down by him? Would a margin (say) of 5° be somewhere near the mark? What is about the difference of mean temperature in the unwarmed parts of a dwelling-house, where the meter is usually to be found, and that of the outer air? In the case of some of the largest consumers, such as factories, where the meter commonly occupies a shed to itself, away from any source of artificial heat, the difference cannot be material. The circumstance that Mr. Livesey's observations on the subject engaged the attention and obtained the approval of Mr. Alfred Lass, who may fairly be styled *the* gas companies' accountant and statistician, is noteworthy, as indicating that the system recommended by Mr. Livesey is likely to be extended.

#### Abandonment of the Cheltenham Corporation Bill.

Once more the great practical value of the Borough Funds Act has been manifested, by the refusal of the Cheltenham owners and ratepayers to sanction the promotion of the Corporation Bill for the compulsory acquisition of the undertaking of the Gas Company. Only 1433 voters could be induced to support the legislative programme of the Corporation, notwithstanding the advantages enjoyed by a local authority—in this case freely utilized—for influencing public opinion. Our expressed views of the quality of the Corporation proceedings in this regard have therefore been fully borne out by the issue. We declared from the very first that the Corporation Bill was uncalled for, and undesirable in the interest of the town; and it is gratifying to know that this is the view of it prevailing in the town itself. By the same vote, the stiffness will also be taken out of the opposition by the Corporation to the Company's Bill. Opposition there will, of course, be, and very properly, as we have all along admitted. But the knowledge that the townspeople would not trust them with the control of the undertaking will have the effect of restraining within reasonable and harmless bounds the efforts in criticism by the Corporation. Cheltenham is as well served with gas as any town in the three kingdoms; and it is just as well that Parliament, when settling the terms of the Company's Charter for the next decade or so, should have this fact, and the evidence of the townspeople's knowledge of it, made plain to the comprehension of the ordinary member of committee.

#### The Responsibilities of Local Authorities.

An important judgment has been delivered in the Appeal Court in the case of *Hardaker v. The Idle District Council and Thornton*, which will be found in our "Legal Intelligence" in the present issue. At the last Yorkshire Winter Assizes, the plaintiff sued the District Council and the other defendant, a road contractor of theirs, for damages for injuries to the persons and property of himself and his wife, caused by a gas explosion traceable to the careless execution of sewer work. The facts were established, and the plaintiff was awarded £45 and costs; but Mr. Justice Wright dismissed the District Council from the action, on the ground that there was nothing to show that the defendant Thornton, whose negligence of duty caused the injury complained of, was not an independent and responsible contractor. This reading of the law did not satisfy the plaintiff; and he appealed for a new trial or judgment against the District Council. In the event, he obtained the latter form of relief, upon grounds which are worth considering, as, in giving the unanimous judgment of the Court, Lord Justice Lindley laid down, with clearness and force, the law of the responsibility of local authorities to gas companies and the public. He pointed out that local authorities have powers under the Public Health Act which they may exercise through their own servants or by the agency of contractors. If they take the latter course, they are not thereby absolved from the responsibilities to other people under which they originally lie, whatever these may be. They must do their duty; and if this is done by contract instead of by servants, there is a certain measure of relief from responsibility for casual or collateral negligence which would rest upon them in the latter case. In the present instance, a proper sewer connection had to be made; and this was not done, as it should have been, with due regard for the security of the gas-pipes in the neighbourhood. Consequently, the District Council were liable for any mischief due to this dereliction of duty. The defendants pleaded that their liability, if any, was to the owner of the gas-pipes, and not to the plaintiff. But this is declared to be inconsistent with decided cases. It is curious to think into what strange ways this judgment might lead litigants, if interpreted by the lay mind; and we do not care to discuss it at length on this account.

#### An Extraordinary Gas Company.

At a recent meeting of an American district society of electricians, a Mr. W. J. Buckley read a paper on certain modern aspects of gas and electric lighting undertakings —of course, as viewed from an exclusively American standpoint—which are worthy of passing notice. Speaking as an electrician, he referred to the disastrous effects of the competition of the Welsbach light. He said, in the "graphic" style affected by his species, that "the Welsbach fad strikes a town over night, and goes through it like a dose of measles. It lasts about nine months, will usually displace one-third of your lamps in service, which, owing to the many objections of the burner, developed in its use, gradually return like lost sheep to the fold until the former output is reached, if not passed, by the demand created for a more liberal illumination." The meaning of the whole of this slovenly passage is not particularly plain; but it is clearly the author's purpose to persuade his public that the fashion of incandescent gas-lamps only lasts nine months or so, and then passes away, leaving a taste for improved electric lighting behind it. There is no difficulty in accepting the proposition that incandescent gas-burners make an electrician who is desirous of retaining his lamp connection see to it that these lamps are bright. Mr. Buckley suggests that upon every central station switchboard should be written: "Keep up the candle power to keep your job." But we fancy he must be in error in supposing that this solicitude need only be felt for a period of nine months or thereabouts. Perhaps as the United States are so great, the months there are as long as our years, which would go far to explain the matter. Curiously enough, the method of meeting Welsbach competition which appears to best commend itself to Mr. Buckley is ascribed to "the President of the Calumet Gas Company of Chicago," who are described as "operating the second largest arc plant" in the United States. This system is worked in "blocks of five;" that is to say, it means "500-candle power lamps, 5-16 carbons, $5 per month, 5 per cent. discount when paid within five days after the first of the month." It sounds quaint; but alliteration is not argument, albeit there may be some use for it as an aid to the memory. But what is one to think of a Gas Company who compete with incandescent gas lighting by means of arc lamps? This is a terrible Company in other ways. Living in the midst of alarms of competition by rival ventures in the same line of business, it has, we are told, but one fighting rule, which is to "drop the prices down at one stroke to a point where the other fellow must lose. Deprive him of all revenue, and he is forced to quit."

Nothing more than a good reserve of money is needed to carry on business upon this principle; and it comes cheaper in the end than buying aldermen, who are a very risky holding. The administration of a Gas Company chiefly dependent upon electric lighting, and always liable to be called upon to "fight on the jump" for bare life, must be lively work. At any rate, one may be sure "red tape" is at a very heavy discount in the head-quarters of such an undertaking.

### Government Conciliation in Trade Disputes.

On Thursday last, Mr. Ritchie obtained leave to introduce the Government Bill to make better provision for the settlement of industrial disputes, which is also a subject of solicitude with that "member-of-all-work," Sir A. Rollit. Both Bills proceed on lines with regard to the legalization of official arbitration in trade disputes which are substantially identical. But the Government measure is a much more elastic (or perhaps it might be better described as a milder) scheme of interference with the course of industrial troubles. Sir A. Rollit's Bill contemplates treating the "parties" to a trade dispute as though they were entities who might be held to good behaviour and submission, like parties to an ordinary lawsuit. The Government propose merely to give statutory powers to the Board of Trade to endeavour by negotiation to bring about a friendly settlement of any dispute in regard to which the Department is appealed to by the parties. As Mr. Ritchie confesses, there is not a great deal in this proposal, considering that the Board of Trade can do as much without legislation. He contended, however, that legislation upon this line is desirable, as putting the Board of Trade in a much stronger position for dealing with such matters. At present, any action which the Department might offer to take in this regard could be resented as unwarrantable interference, which would not be the case if there existed statutory authority for endeavouring to conclliate, or proposing arbitration. From the very moderation of the Government Bill, it appears how little real scope there is for any formal means of determining industrial disputes. There is the great initial difficulty of ascertaining who are the true "parties" to an issue of this kind, which appeared plainly enough in the recent engineers' strike. This one obstacle alone seems sufficient to bar the way to the best-intentioned legislation of the character desired by Mr. Ritchie and the member for Islington. Sometimes one of the parties to a trade dispute is the Trade Union; sometimes it is an affair of the workmen concerned, without anything behind them that could be brought in as answerable for the keeping of the terms of an award. Legislation confronted with this difficulty would scarcely show to advantage.

### Opinions of an Old Trade Unionist.

There is some interesting reading in the last annual report of the Steam-Engine Makers' Society, recently issued by the Secretary, Mr. James Swift. As the Society can look back upon an experience of seventy-one years, it may well claim to be in a position to criticize the principles of the mushroom growth of the New Unionism which sprang up outside the scope of the steady-going old Trade Societies; and the Secretary does this very trenchantly in his introductory address. Referring to the New Unionist contention that Trade Societies should confine their work solely to "combating the capitalist," leaving to friendly societies the providing of sick and other benefits, Mr. Swift remarks that few, if any, of the Trade Unions that adopted this principle have shown any staying power. So soon as the first period of excitement was passed through, and contributions had to be paid without showing any immediate return, the membership lapsed. As evidence of this, and showing the rise and fall of New Unionism, it is stated that in 1890 the returns of membership of five societies made up a total of 266,000. According to the latest return, the same societies have fallen to a membership of 54,700; so that, as Mr. Swift puts it, "Trade Unionism "is weaker by over 211,000 in these cases than it "was five years ago." He may be right in arguing that had these societies "been financed to provide "some benefits, however small, other than strike pay "or management expenses alone," they would still have been a power in their separate industries. The point is, obviously, whether the members of the new unions could or would have supported societies that make such heavy demands upon their supporters as the old unions do, not always wisely or for justifiable objects. There is a good deal to be said for the contention that the proper work of a provident society should not be mixed up with the programme of a "fighting" union. Of course, the new unions failed to keep their membership up to enthusiasm level. But their decline is traceable quite as much to the incapacity and folly of their professional heads as to the inherent weakness of their cause. And what will the men whose policy Mr. Swift condemns have to say if the older Trade Unions who pretend to give benefits to their members turn out to be insolvent after all? A few years will tell a tale of Trade Unionism old and new that the rising generation of workmen will attend to very seriously.

## WATER AND SANITARY AFFAIRS.

The report for the year 1894, by Major-General A. de C. Scott, the Water Examiner appointed under the Metropolis Water Act, 1871, appears in the appendix to the annual report of the Local Government Board, issued on Tuesday last. In juxtaposition, we have Dr. Frankland's annual report on the London Water Supply, published as long ago as May last in the annual summary respecting London, issued by the Registrar-General. It would add much to the interest of General Scott's report, if some channel could be found for it by which it could be published as promptly as the document prepared by Dr. Frankland. The report by Colonel Ducat and Dr. Barry on the inquiry held by them in October last respecting the East London water supply, was issued by the Local Government Board as a separate paper nearly three weeks ago. It would be an advantage if General Scott's report could also appear in a separate form, in which case we might have seen it by last Midsummer. If it is desirable that this statement should still swell the bulky volume of 600 pages constituting the official Blue-book, the report could be printed over again, as in the case of Dr. Frankland's account.

Some drawback to the piquancy of General Scott's report arises from the yearly repetition of what is termed "standing "information." General Scott explains that this is given in order to save the reader the trouble of referring to past reports. The explanation is very good; but the result is that General Scott's fresh facts are so mixed up with the old, that it is difficult in some instances to extricate one from the other. If the old stores made their appearance in smaller type than the new, the reader would be able to fasten at once on the points of special interest. But we fear these are refinements beyond the reach of the Local Government Board. It may not be the fault of the Board; but it seems odd that, while a separate paper has given the public an account of Colonel Ducat's inquiry held last October with respect to drought, the official report of the inquiry regarding the previous frost has not appeared. Are we to wait for this until the annual Blue-book comes out a year hence, so that we may learn in February, 1897, all about the frost in February, 1895? This is long waiting; and there is no saying what may happen in the interval. The Government Bill now promised may so change the aspect of affairs, as to render anything which occurred to the Metropolitan Water Supply in the year 1895 a matter to be looked back upon as possessing very little consequence.

One thing to be easily observed in General Scott's report, is that many of the figures undergo a change from year to year. Thus the population supplied by the East London Company in 1894 was more than 19,000 in excess of that in 1893. But the New River growth was only 6000. The population supplied by the whole of the Companies underwent an increase of 70,596 in the year ending Dec. 31, 1894. A table showing the average population in each year makes the increase still higher; and General Scott, in one part of his report, credits the East London district with an annual increase of 20,000 persons, on which he remarks that there is "no finality" in works of storage where the population grows at such a rate, even though the East London Company, under their Act of 1894, will about double the capacity of their storage reservoirs. It is mentioned that the year in which the Act was passed, was marked by an incident which emphasized the relation so frequently referred to between the dry weather discharge of the Lea and the supply that is required for the East London district. From Aug. 8 until Oct. 28, 1894,

the Directors of the Company found themselves under the necessity of shutting off the supply of water during the night to three-fourths of the houses within their district. General Scott says: "This course became im-"peratively necessary in consequence of the reduced "discharge of the River Lea, and the depleted condition "of the reservoirs." Other particulars are given, which show that the experience of 1894 in respect to the East London water supply was virtually that of 1895, only on a smaller scale. Some important remarks are made as to the mode of maintaining a constant supply. Concerning the obligation which devolves on the Companies to keep up a supply at pressure "in any case," it is observed that, "as the responsibilities involved are immense, the powers "conferred for the purpose of regulation should be corre-"spondingly wide." Considering that it is now "only "a question of a few years" before the system of constant supply becomes universal in the Metropolis, General Scott evidently contemplates a more effective regulation of the consumers' fittings and pipes, so as to bring the waste of water "within reasonable limits." Another requirement is that storage in house cisterns should be strictly "enforced."

The Local Government Board, in the report which bears the signature of Mr. Shaw Lefevre, refer to the subject of storage as provided by the Companies, and say: "We have in our previous reports dwelt strongly on the "necessity of providing additional reservoirs for the "storage of water for Metropolitan use." The report of the Royal Commission in 1893, and "the experience of "the year 1894," are said to confirm the accuracy of these views. We need scarcely suggest that something more may be said in the same direction a year later. The steps taken by the Companies for the extension of their works, so as to remedy present defects, are spoken of approvingly by the Board, and in a very different tone from that adopted by the "Daily Chronicle," which has nevertheless had to acknowledge that in the East London inquiry there was a "partial breakdown of the case for the prosecution." In regard to that inquiry, a trenchant blow is aimed at the County Council by the "St. James's Gazette," which looks upon the evidence given before Colonel Ducat as proving, point by point, that the Council not only opposed the necessary works, which would have averted the scarcity of water, but in doing so "concealed a certain im-"portant document from its own Engineer, who must other-"wise have materially modified his own expert opinion on "the question." The "St. James's Gazette" presses this home in terms of the most emphatic character, and hopes the charge may be discussed in Parliament. But the march of events is rapid; and the conduct of the Council may escape the censure it deserves.

Mr. Allen Stoneham, the Auditor appointed under the Metropolis Water Act, 1871, gives particulars furnished by the courtesy of Sir Richmond Cotton, the Chamberlain of the City of London, showing that this functionary had received, down to the end of 1894, various sums, amounting in the aggregate to £8867, from the Companies required to form sinking funds. Mr. Stoneham expresses his fear that the growth of these funds will be impaired by the large expenditure the Companies are undertaking in order to improve their works and storage reservoirs. Thus it is impossible to please everybody, or to satisfy all demands. The Auditor has much to say about the sinking-fund clauses, and goes into their history. As an encouraging feature, Mr. Stoneham states that a considerable payment to the Chamberlain may be reasonably expected from the West Middlesex Company in the course of a few years. Meanwhile the Company will be enabled still further to reduce the water-rate payable "in not the least "wealthy district of the Metropolis."

The address delivered at the Royal Institution on Friday evening by Dr. Frankland, on the Water Supply of London, carries with it peculiar weight, as proceeding not only from a scientific expert, but from an acknowledged authority on the subject, occupying in reference to this particular topic a responsible position in connection with the Local Government Board and the Registrar-General. In years gone by, Dr. Frankland has been known as an unsparing critic of the results produced by the London Water Companies. But the past history of the supply differs from the present; and Dr. Frankland can now show how material has been the change. By degrees, the evil reputation inherited from conditions which no longer exist, has been overcome; and the character of the London Water Supply is at length fully redeemed. The extinct order of things dates from 1883 backwards, with a still worse state of affairs prior to 1829, when river water was supplied to London without any filtration whatever. Since 1883, filtration has been "uniformly excellent;" removing to an extent "simply astounding" those living organisms which abound in the raw river water. But although it is to the action of pathogenic microbes that zymotic disease is to be attributed, it is remarkable that not one of these hurtful organisms has ever been detected in the unfiltered river water. This, we apprehend, must point to a great advance made in the exclusion of sewage matter from the stream. An improved river and an effective filtration are giving to London that which, for palatability, wholesomeness, and general excellence, is declared by Dr. Frankland to be such as "could not be surpassed by any supply in "the world." With regard to the quantity which may be procured, Dr. Frankland is able to derive data and to cite testimony from the late Royal Commission, and from others preceding it, all serving to show that the quantity of water to be obtained from the Thames basin is so ample as to render the necessity for going elsewhere "a very remote contingency." Calculations are given, proving that for at least half a century to come, and probably for a longer period, London, including its environs, is secure against any lack in the admirable supply which it now enjoys. Dr. Frankland's address was received with much applause by a distinguished audience; and we may congratulate both the sanitarian and the ratepayer on the conclusions which have been so forcibly demonstrated.

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**Petroleum from the Caspian Sea.**—The island of Tscheleken, in the Caspian Sea, is found to contain petroleum springs yielding oil resembling the Pennsylvanian product, and very different from that of Baku. The crude oil produces nearly 29 per cent. of its volume of kerosene, which burns similarly to American oil; and the higher fractions are rich in vaseline.

**The Proposed Supply of Water to London from Wales.**—The Earl of Onslow has given notice on the *agenda* of the County Council for to-day, that, on the bringing up of the report recommending further outlay in preparing the project of a Welsh water supply for London, he will move an amendment, which, while speaking favourably of the scheme, goes on to say that, "inasmuch as Her Majesty's Government has given notice of legislation on the question of the London Water Supply, it is inexpedient to incur further expenditure until the views of the Government be known." On this ground, it is proposed that the Committee "report further on the question" in three weeks' time.

**Petroleum Benzine and Coal Tar Benzene.**—According to an abstract which appears in the current number of the "Journal of the Society of Chemical Industry," the use of iodine has been recommended for distinguishing between petroleum benzine and benzene derived from coal tar; the test depending on the variation in coloration of the solutions of iodine in the respective hydrocarbons and mixtures thereof. The test is stated to be of very limited value in regard to mixtures; visible variations of colour being determined only when the proportion of admixture is high. Better results were obtained by taking advantage of the relative solubility of asphalte in benzene. The asphalte being prepared from Syrian asphalte by exhaustive washing with petroleum naphtha, to free it from constituents soluble in these hydrocarbons, was treated, under uniform conditions, with mixtures of petroleum benzine and coal-tar benzene, up to 70 per cent. of the latter. A well-graduated series of colorations from straw colour to dark brown, proportionate to the percentage of the latter, was observed. As an empirical test, therefore, it is considered to satisfactorily fulfil ordinary requirements.

**Manchester District Institution of Gas Engineers.**—The twenty-sixth annual meeting of this Institution will be held at the Grand Hotel, Manchester, next Saturday; and, judging by the circular which has been issued by the Hon. Secretary (Mr. S. S. Mellor, of Northwich), the proceedings will be of special interest. The members will assemble at eleven o'clock at the hotel, where conveyances will be in readiness to take them to the Bradford Road Gas-Works of the Manchester Corporation, which will be inspected, by permission of Alderman Gibson, J.P., the Chairman, and the members of the Gas Committee, at the invitation of Mr. G. E. Stevenson, M.Inst.C.E., the Consulting Gas Engineer to the Corporation. At the opening of the business meeting, after lunch, the retiring President (Mr. G. Smedley, of Buxton) will occupy the chair; but, after the election of three new members and the officers for the current year, he will introduce his successor (Mr. Isaac Carr, Assoc. M.Inst.C.E., of Widnes), who will deliver his Inaugural Address. Mr. S. R. Ogden will, as promised, supplement his paper of last November by some additional particulars in regard to the installation of carburetted water gas at Blackburn; and this will bring the meeting to a close. The members will afterwards take tea together as usual.

# ESSAYS, COMMENTARIES, AND REVIEWS.

## GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 423.)

THE course of things on the Stock Exchange last week was remarkable, although it was wholly free from any exciting incident. The tendency was somewhat uncertain at first; but it soon settled down into a strong and steady advance. In the more speculative departments, business was quiet. But for choice investment securities, there was a great demand; and their prices rose materially. Consols steadily mounted up until on Thursday and Friday they were done at 110; thus distancing by far any previously attained figure. There was a slight reaction on Saturday; but there is nothing to prevent their going higher yet. This great price has revived the consideration of some highly interesting questions in connection with the sinking fund, for which, however, we have no space. Many other departments sympathized in the upward movement; and prices all round, almost without exception, show a good advance. A noteworthy fact in relation to the Money Market is that on Thursday the 2 per cent. Bank rate completed the second year of its existence, which is without a precedent. One is tempted to prophesy, but had better not. While all the other good things are rising, it almost goes without saying that Gas securities have gone up. Business was not particularly abundant—rather below the average indeed; and more than the lion's share of it was taken by Gaslight and Coke issues. But prices were as strong as ever, or stronger; and a considerable number of quotations have made large advances, while none have receded. Gaslight "A" was in great form, and pushed steadily up from 301 on Monday to 307 on Friday and Saturday—a high figure *ex div.* The secured issues, too, commanded large prices; and the "H" showed in advance. South Metropolitans were only moderately active, but very firm; and the quotation of one or two issues would have borne raising. Commercials were still advancing; and both the old and the new scored a point. Suburbans and Provincials were quickly snapped up when obtainable; and Brentford and Crystal Palace raised their prices. The Continental Companies found favour; and Imperial and Union materially advanced. Among the rest, Buenos Ayres, San Paulo, and Melbourne improved. Business in the Water Companies was unusually brisk; and every one of them has again made a considerable improvement in its market position.

The daily operations were: Business was not very active on the opening day; but prices were firm. Melbourne 5 per cent. bonds rose 1. East London Water gained 2. Tuesday was quieter still; but quotations were more lively. Crystal Palace and Continental Union advanced 3; ditto preference, 5; and Gaslight "A," 2. In Water, New River rose 5; ditto debenture, 4; Chelsea and Lambeth, 2; and East London, 1. There was great activity on Wednesday, especially in Gaslights. Commercial Old and New and Imperial Continental rose 1; San Paulo, ½; and Buenos Ayres, ¼. In Water, Southwark debenture rose 2. Business fell back quiet on Thursday; but quotations were very buoyant. Gaslight "A" and Imperial Continental moved up 2; and Brentford old, 3. In Water, East London advanced 4; Chelsea, 3; Lambeth tens, Southwark, and ditto "D," 2; Lambeth 7½ per cent., 1½; and Grand Junction, 1. There was rather more doing on Friday. Gaslight "A" improved 1; and ditto "H," 2. Further advances were made in Water. Southwark rose 4½; both Kents, 3; Chelsea and New River debenture, 2; and East London, 1. Saturday's transactions were about an average. Gaslight "A" advanced 2; and Buenos Ayres, ¼. In Water, Grand Junction rose 1.

## ELECTRIC LIGHTING MEMORANDA.

**How Electric Industries have been Exploited—Electricians' Frauds—Litigation and Mismanagement—The Future of Electric Industry.**

A REMARKABLE article on "The Commercial Exploitation of Electricity" appears in the current number of the "Engineering Magazine." It refers primarily to the state of the electrical industries of America; but it is capable of more than national application. The author, Mr. B. E. Greene, begins with the candid statement that the unhealthy commercial condition of the electrical industry of the United States is known to everybody engaged in it. "That it has never returned to the investor any reasonable profit is equally well known, as is also the fact that the small army of patient and worthy inventors have received scant reward for their labours." The article therefore proceeds to review briefly the commercial development of "the art," with the object of discovering the reasons for the past and present unsatisfactory conditions. This development dates from the organization of the Brush Company, about 1877; but little was done before 1880, when capitalists generally began to take an active interest in it, and when newspaper articles showing the marvellous possibilities of the new industry became common. Mr. Greene admits that "even the 'booming' articles in the daily press, prepared by paid agents of manufacturing companies, were well within the bounds of truth as to the possibilities of development, except in the one important point of the cost of producing power. To the shame of some of our leading inventors, it must be admitted that these misrepresentations emanated chiefly from those who knew better;" and the consequence is that millions of honestly-invested capital have been lost by the public who trusted these deceivers.

Mr. Greene declares that, "to the leaders in the science, it was as well known in 1880 as to-day that electric lighting could never compete with gas on the score of economy." Yet the pioneers of the new movement circulated "flat misrepresentations and misconceptions" which caused wide-spread loss and disappointment. We wish it could be said with truth that the same sort of mischief is not perpetrated to-day, and that not in holes and corners, but in important places in the United Kingdom, and under cover of well-known names. The first mistake of the electrical speculators, according to Mr. Greene, was in pushing the business before it was properly developed. One of the early salesmen of lighting plant told the writer that, up to 1885, they all knew, when they were selling electric appliances, that every purchaser would lose his money: "We knew the apparatus was not commercial; but we were hired to sell goods, and we sold them." A complete justification this of the line of criticism upon matters electrical followed at the time in these pages, and in hardly another journal. Moreover, in these early days, "scores of men who had never made headway in any other undertaking thought they had found in the electrical business the long-looked-for opportunity of making money without honest labour." These freebooters swarmed into electrical enterprise, pushing honest and hardworking inventors into the background—only to exhibit in the long run their own incompetency, as well as the weakness of the business which they had appropriated for their own. But in the meantime the money of the misguided investor was squandered in bad management.

Still, the electric lighting and traction industries grew, because they could not be prevented from growing, until the total of the capital sunk in them has attained the present enormous figure—estimated at 750 million dollars for the United States alone. "Returns to stockholders in dividends have been insignificant." Mr. Greene finds several reasons for this deplorable result. Foremost of these, is the "curse" of an "insatiate desire to control, to drive out all competitors, to monopolize." Every electrical "corporation" wanted to have the field of business all to themselves, in order that they might charge what they pleased for their wares. From this grasping spirit, sprang a tremendous volume of litigation over patent rights, very few of which were maintained. For this, the patent system of the States has been blamed; but the fault really rests upon the arrogance and ignorance of the controllers of the corporations. "Those in control have believed, or assumed to believe, that the art itself was born after 1880. They have ignored the facts of record—that fundamental principles had been for years taught in the leading schools, especially in Germany, England, and Scotland; that the commercial adaptation of well-understood foundation principles was scarcely in the nature of invention, but rather development—the natural result of so many bright minds, fertile in expedients, labouring for a common end." Worse even than the litigation, was the waste of years in "making trades, deals, and working arrangements, none of which has had any result other than preventing the achievement of substantial commercial success."

Upon the top of all this, came the speculating in the stocks and bonds of electrical manufacturing, financing, and lighting companies. The manufacturing companies could not wait for a legitimate demand for their wares to spring up, but launched out into the promotion of companies who were to be their customers. No wonder electric lighting advanced, to all appearance, like wildfire. It meant that a large number of unprofitable stations were started, every one of them largely over capitalized, with the effect of flooding the money markets with millions of so-called "securities" which could never return a dividend. "No stronger proof is necessary that the general conduct of the business has been utterly wrong than the fact that, of all the large pioneer companies doing business before 1886, not one remains." From the worst of this mischief the United Kingdom was preserved, by the prompt passing of the Electric Lighting Act, 1882.

Mr. Greene thinks that there may be a bright future for electrical industry; and that it may yet be made profitable, if shareholders in manufacturing companies will abjure speculation and speculative methods. This is no more than has been effected in this country, with good results in several instances. The heads of the British electrical industries learnt at an early date that engineering business should be severed from lighting undertakings; and those who failed to observe the distinction between legitimate business enterprise and "financing," have long gone the way of all hopeless blunderers. We have a considerable number of electric lighting ventures in different parts of the country which can never pay; but as most of these are in the hands of local authorities, nobody is going to be ruined by this circumstance. The prospects of British electric engineering concerns are not bright, by reason of there being no more big things in the shape of nicely arranged contracts with concessionary companies to hope for; and though the electric lighting stations are numerous enough to provide a large volume of work of one kind or another, their proprietors are in the generality of cases in a position to insist upon getting money's worth for their payments for machinery and plant. All the really valuable

patents have run out; and commercial competition is so keen that commercial profit is cut down to the thinnest of margins. The electric engineering business may not be worth going into; but there are sufficient firms actually engaged in it who must keep their shops open, and these will not all fall into insolvency.

## WATER COMPANIES' RESPONSIBILITIES.

The East London Water Company have lately had to take up the gauntlet of litigation in more than one legal arena. Before the Lord Chief Justice and a special jury in the Queen's Bench Division, as reported in the "Journal" last week, the familiar allegation of negligence had to be met in an action brought by a Mr. Macaire. The dispute arose in consequence of an escape of water from one of the Company's fire-plugs. The appliance in question, it was argued on behalf of the Company, would have been perfectly safe but for the exceptional frost of January and February, 1895. This was not the first time, as we have had occasion to notice, that the frost has been pleaded by way of defence in similar circumstances; but in this instance, unlike those of previous date, the defence was not successful. Thus, the glorious uncertainty of the law has once again been made manifest. It may be that something more will be heard of the case; but, in the meantime, we have, at any rate, a judicial reminder from Lord Russell of Killowen of the doctrine which, in the general way, governs the liability of water companies. The jury, his Lordship explained, were to clearly understand that water companies are not insurers; in other words, they do not undertake that there shall be no damage done by reason of an escape of water. What they are bound to do is to conduct their business with due and proper care. To which his Lordship added that, looking to the large powers vested in water companies, the jury ought to exact from those companies a high degree of care! Whether, with all respect to Lord Russell, this is sound and safe doctrine—whether any exceptionally exacting construction ought to be placed upon the acts or omissions of a water company—may possibly be open to doubt. But the jury availed themselves of the judicial encouragement thus held out, and returned a verdict for the plaintiff.

The other case in which the East London Company were concerned was argued before two of the Lords Justices of Appeal; and it drew from Lord Justice Lindley and his colleague Lord Justice Kay elaborate and interesting judgments, which were fully reported in our last issue. The complainant, assuming the office of a public prosecutor or Metropolitan authority, had laid an information against the Company for "failing to supply a sufficient quantity of water for domestic purposes." Apart from a point on which the Magistrate appears to have taken an erroneous view, the Court had to decide the broad issue whether any inhabitant who considers himself aggrieved is entitled to proceed for penalties under section 16 of the Metropolis Water Act, 1871. The penalty under this section is not to exceed £200; and it is quite distinct from the penalty under section 43 of the Water-Works Clauses Act, 1847, which is £10 or under. Without touching upon the continuing penalties for which the two Acts provide, it at once becomes clear that the Legislature could not have intended to confer on every individual who considers himself aggrieved the choice of proceeding under whichever of the two Acts, and for whichever of the two penalties, he pleases. It is to be observed that the smaller penalty can only be proceeded for where the informant has paid his water-rate in advance. But according to the contention of the appellant (Mr. Kyffin), in the case under notice, his default in that respect actually left him free to enforce far more penal consequences than a £10 fine against the Company with which he was at issue. This monstrously illogical and audacious contention has been explicitly disallowed by the Court. It is not necessary to cite at length the reasoning of the learned Judges, by which, however, it was made perfectly clear that the law in this instance accords strictly with common sense. The heavy penalty under the Act of 1871 can only be enforced at the instance of the public authority, whose special duty it is to see that, where the companies are under obligation to furnish a constant supply of water, that supply shall be duly forthcoming. It is necessary, as Lord Justice Kay observed, to look at the whole scheme of water-works legislation. When this is done, instead of picking out isolated sections, and seeking to wrest them to preposterous uses, the position becomes sufficiently plain and intelligible. The appellant's contention, in short, involved an *argumentum ad absurdum*. The whole thing was so barefaced and unwarrantable, that Lord Justice Lindley summarily rejected his Counsel's final plea for consideration in the matter of costs; and his Lordship added, by way of postscript, "I consider it is a very outrageous business, now that I understand it"—a pronouncement which all reasonable men will unhesitatingly endorse.

**Gas-Engines for Electric Lighting.**—An electric supply station in Chicago, lately completed, is worked with gas-engines. They are double acting, of English manufacture, and of 80, 130, and 200 horse power respectively. Natural gas is used for driving them; it being piped from the Indiana gas-fields, about 175 miles from Chicago. This gas is stated to be much cleaner than producer gas for motor purposes.

## PERSONAL.

Mr. J. Dorsett has joined the directorate of the New Marlow Gas Company, Limited.

Mr. F. Clibborn has been appointed Superintendent of the Strood Water-Works of the Rochester Corporation.

Mr. H. J. Bell has been appointed Director of the Lambourn Gas Company in place of Mr. J. H. Light, resigned.

Mr. T. Littlehales, formerly of Hamilton (Ont.), has taken the management of the Syracuse (N.Y.) Gas-Works.

Mr. J. Phillips, the Secretary of the Bristol Gas Company, has been granted an advance of £100 per annum in his salary.

Sir Henry Roscoe has been elected Vice-Chancellor of the University of London in place of the late Sir Julian Goldsmid.

Mr. Fenwick Richards and Mr. J. H. Lockley have been elected Directors of the Bristol Gas Company in place of Mr. S. Jones and Mr. J. A. Jones, deceased.

Captain F. Hooper Rawlins has been elected a Director of the Rochester, Chatham, and Strood Gas Company, in place of the Rev. F. J. Rawlins, who has resigned after being on the Board about twenty years.

The shareholders of the South Hants Water Company have agreed that the honorarium to Mr. J. C. Amos (one of their Directors) shall be £600. This is in recognition of the valuable engineering services he has rendered to the Company during the past four years.

Mr. W. M. Finch, under whose superintendence the whole of the work in connection with the newly-formed Higham and Hoo Water-Works were carried out, has been appointed Resident Superintendent of the Chatham Water-Works, in succession to the late Mr. G. Maycock.

In conjunction with the advance in the salary of Mr Isaac Carr, Assoc.M.Inst.C.E., the Gas and Water Engineer of the Widnes Corporation, mentioned last week, Mr. F. Thorpe, the Assistant-Engineer, received an addition of £20 per annum, and various increases were granted to the workmen.

In recognition of his services in securing a new water supply for the town, Mr. J. Kittow, ex-Mayor of Launceston, has been presented with his portrait by his fellow-townsmen. The presentation was made by the Mayor (Mr. T. P. Trood) at a dinner which brought together a large and representative gathering.

It is likely that Mr. Thomas Newbigging, of Manchester, will be the expert who will inquire into the charges which were made against the management of the Gas Department, by Mr. D. Dawson, at a recent meeting of the Longton Town Council (see *ante*, p. 305). A resolution has been passed inviting Mr. Newbigging to undertake the investigation.

Mr. C. E. A. Armitage (son of Mr. Charles Armitage, Assoc.M. Inst.C.E., Gas Engineer of the] Lancaster Corporation) has successfully passed, in the first division, the matriculation examination at the London University. He received his early training at the Lancaster Grammar School; and he has been studying at University College. We learn that Mr. Armitage intends to enter the medical profession.

Estate duty has been paid on the personal estate, valued at £603,313, of the late Mr. Frank Ernest Hills, of Penshurst, Kent, the eldest son of the late Mr. Frank Clark Hills, of Deptford, who died a few years ago leaving personal estate worth nearly £2,000,000 sterling. Duty has also been paid on £750,077, the value of the personal estate of Mr. Edward Henry Hills, of Deptford, younger brother of Mr. F. E. Hills.

Mr. W. Statter, J.P., who presided at the half-yearly meeting of the Wakefield Gas Company on Monday last week, as mentioned elsewhere, stands in the unique position of having held the chairmanship of a gas company more than half a century. When in the prime of life, Mr. Statter took the control of the above-named undertaking; and now, in his ninetieth year, he occupies his accustomed position, surrounded by his younger colleagues, and presents to the proprietors a good account.

Mr. W. J. Dougall (son of Mr. A. Dougall, the Manager of the Hull station of the British Gaslight Company), whose appointment as Engineer of the Sevenoaks Gas Company was recently noticed in the "Journal," was presented, on Monday last week, with a marble clock, with side ornaments, cases of table cutlery and serviette rings, and an illuminated address, subscribed for by the employees at the Hull Gas-Works and a few friends, as a token of their esteem for him, on his leaving Hull to take up his duties in the south.

**Humane Society's Awards to the Heroes of the Tynemouth Disaster.**—The Royal Humane Society have awarded medals to William Reay and James Cummings, and testimonials to Christopher Cumpson, James Forster, W. Brown, J. Pattenson, T. Cook, H. Harrison, J. Vickers, and J. Johnson—all workmen in the employ of the Tynemouth Gas Company—for the gallantry displayed by them on the occasion of the fatal escape of sulphuretted hydrogen in connection with the Company's sulphate plant on the 20th of January.

# NOTES.

### The Protection of Petroleum Tanks from Lightning.

At a recent meeting of the Physical Society of Berlin, Professor Neesen described two interesting strokes of lightning which had come under his notice. One of these struck a church unprovided with a lightning-rod, and stopped at the organ. Its peculiarity was the appearance presented by the inside of the roof, which was rent in the same manner as is observable in cases of trees similarly struck. The other stroke happened to a petroleum store, where there were four tanks, protected by five-pointed conductors apparently adequately earthed. Two of the tanks were completely shattered by a violent explosion; and the others were burnt out by fire following the lightning. Professor Neesen was of opinion that the vapour of petroleum rising in the air from the tanks was first ignited by small sparks during the discharge; and this view was verified by experiment. He therefore suggested that, in order to adequately protect petroleum tanks from lightning, it is necessary that all openings through which vapour can escape should be guarded with wire netting, upon the principle of the Davy safety-lamp. The subject is to be commended to the notice of all persons responsible for the proper storage of petroleum in bulk.

### The Liquefaction of Gases.

In the course of a lecture, on the liquefaction of air and research at low temperatures, recently delivered before the Chemical Society, Professor Dewar introduced a new form of apparatus, apparently designed on the Linde principle, whereby liquid oxygen can be produced in all laboratories. The cooling is effected by solidified carbonic acid; and no mechanical exhaustion is necessary. Professor Dewar has experimented with solidified air, which at first exists as a stiff transparent jelly. When placed in a magnetic field, the still liquid oxygen is drawn out to the poles; showing that solid air is a nitrogen-jelly containing liquid oxygen. Solid air can only be examined in an atmosphere of hydrogen, because it instantly melts on exposure to the air, at the same time welling up like a fountain. The density of liquid air is ·910. If a small jet of hydrogen is ignited and plunged below the surface of liquid oxygen, it continues to burn; all the water resulting from the combustion being carried away as snow. In the same way, graphite or diamond, when properly ignited, burns continuously on the surface of liquid oxygen; producing solid carbonic acid, and generating ozone. By a suitable arrangement, a jet of liquid hydrogen can be produced and seen; but the liquid has not yet been accumulated. Such a jet has, however, been used as a refrigerator for liquid air and oxygen, with the result of transforming them into hard, white solids resembling avalanche snow. The solid oxygen had a pale, bluish colour. There is now no reason, apart from the expense, why a spray of liquid hydrogen should not be employed as a cooling agent, in order to study the properties of matter at some 20° or 30° above the absolute zero. The only widely distributed element which has not yet been liquefied is fluorine.

### Testing Waste Furnace Gases.

Messrs. Bryan Donkin and Co. have in operation at their works an arrangement for analyzing furnace gases which is well reputed for reliability and simplicity of operation. It is called the "Waller" apparatus, from the name of the Belgian firm who originally developed and perfected this system of checking the work of the stoker. The apparatus comprises an aspirator and connections, for drawing the gases from the boiler flue, and the appliances for testing them by washing with reagents in the usual way. There is nothing new about the principle; but the whole thing is conveniently planned for handling by persons who are not expert chemists. The main purpose of the testing is to determine the proportion of carbonic acid gas in the flue, which should lie between 11 per cent. with bituminous, and 15 per cent. with anthracite coals. There should be a small percentage of oxygen, and no carbonic oxide. The right proportion of oxygen in any particular instance is a matter for experimental determination; and when once the proper proportions for good furnace working are ascertained, the testing apparatus enables it to be seen whether or not they are adhered to. A comparison between the results of actual working and the standard, will show any defects that may exist in the structure of the furnace or the stoking. It is suggested that a system of bonuses upon the proportion of carbonic acid in the smoke gases would tend to economize good stoking.

### The Superheating of Steam.

A paper on superheated steam was read by Mr. W. Patchell at the last meeting of the Institution of Mechanical Engineers. The author described the M'Phail and Simpson superheater, and claimed that in his own experience (at the central station of the Charing Cross and Strand Electricity Supply Corporation) the introduction of this arrangement resulted in reducing the consumption of coal per electrical horse power per hour from 4·74 lbs. to 4·12 lbs. To increase the steaming capacity of the boilers at this station, induced draught has been applied, with the result that the power of the boilers has been increased threefold. Professor Kennedy corroborated the statement of the good effects derivable from superheating, as exemplified at the Edinburgh electric lighting station, where the system has been found to save about 9 per cent. of the weight of steam required per horse power. Several speakers alluded favourably to superheating; but Mr. Henry Davey expressed the general opinion of mechanical engineers by stating that the question is in a confused state, so that no one could say what should be expected under any given conditions.

### The Direct Fixation of Nitrogen.

Mons. A. Rossel has communicated to the Académie des Sciences a summary of the methods devised and the results obtained in the matter of determining the direct combination of nitrogen with metals and other bases. Mr. J. P. Rickman in 1878 described apparatus whereby nitrogen could be combined in small quantities by heating coke with a fixed base in contact with air. Spongy platinum at high temperatures also converts a small quantity of the nitrogen of the air into nitrous products. But in neither case does analysis show the exact figures. Wigled and Geuther first demonstrated the affinity of magnesium for pure nitrogen, and obtained the compound of nitrogen and magnesium which has played so important a part in the recent discovery of argon. After referring to other researches, M. Rossel remarks that, in studying the investigations of Moissan, he came upon a curious reaction concerning the combination of atmospheric nitrogen in presence of oxygen. Moissan has observed that, at high temperatures, the metals have no action upon calcium carbide. But M. Rossel, working with M. Frank, has found that there is a difference when calcium carbide is heated with pulverized magnesium in a porcelain crucible, and when this is done in a tube in which there is free circulation of tar. The reaction take splace in a regular manner when layers of the two substances, finely powdered, are heated in the crucible over a bunsen flame. Then there soon appears a flame due to the combustion of the carbon of the carbide, which produces carbonic acid; and the calcium also burns to calcium oxide. At this moment, a brilliant incandescence results; and, upon cooling, the magnesium is found almost wholly converted into magnesium nitride. This residue contains as much as 23 per cent. of nitrogen taken from the air. If the contents of the crucible are mixed with water, ammonia is liberated with effervescence. Mixtures of calcium carbide with iron, aluminium, zinc, and even copper, give similar reactions; the result being a nitrogenous product decomposable by water. This is an additional proof that at the epoch of the formation of the earliest geological strata nitrogen did not exist in the free state, but in combination with metals.

# TECHNICAL RECORD.

## SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual Meeting of the Association was held last Thursday, at the Holborn Restaurant, under the presidency of Mr. A. F. Browne (the Engineer of the Rotherhithe station of the South Metropolitan Gas Company). There was a good muster of members.

The proceedings were commenced by the retiring President (Mr. S. W. Durkin, of Southampton) briefly introducing his successor to the members.

The President, on taking the chair, was heartily received; and, having thanked the members for their expressions of welcome, he at once suggested that the minutes of the last meeting should be taken as read.

This was agreed to.

### Annual Report.

The Hon. Secretary and Treasurer (Mr. J. W. Helps, of Croydon) then read the annual report of the Committee. They stated therein that the past year had been an eventful one for the Association; for during that period not only had it to be congratulated on attaining its majority, scoring its first century in membership, and maintaining its usefulness, but it had also received overtures for amalgamation from a kindred Association. These were clear indications of its established strength. The membership of the Association increased during 1895 to 102; there having been nine additions to the roll. Sympathetic reference was made to the sudden and unexpected death of Mr. John Thorman, of West Ham—one of the oldest members; and then the Committee proceeded to give a *résumé* of the year's work. Special mention was made of the very instructive and pleasant excursion to Southampton in May; and the efforts of all concerned in ensuring its success received due recognition. With regard to the financial position of the Association, the expenses of the year were all met, and there is a balance of £46 5s. 10d. to the good.

Mr. J. Tysoe (East Greenwich) thought the members would all agree with him that the report disclosed a very satisfactory state of affairs, more particularly with regard to the increase of members. He proposed that it be adopted.

Mr. J. C. Watson (Lower Sydenham) seconded the proposition, which was carried.

### Thanks to the Ex-President.

The President said it was his privilege to move a hearty vote of thanks to Mr. Durkin for the able manner in which he had discharged the administrative duties attaching to the chair, and for the way in which he had presided over the social functions during the past twelve months—especially on the occasion when, representing the Directors of the Southampton Gas Company, he gave them a most cordial welcome to the works of which he is the Engineer.

Mr. J. Methven (Beckton) seconded the motion, which was carried by acclamation.

Mr. Durkin, in responding, said he did not think he deserved the very kind words that had fallen from his successor in the chair. He took the position of President with a certain amount of nervosity; and if he had satisfied the members, he was most pleased. At the time of the first meeting last year, they assembled under very great difficulties. They were all suffering from a very severe winter; and although that was the case, he was glad to find so many members present. He had to thank them for the support they had collectively and individually given him; and he was glad to know they still appreciated their visit to Southampton. He hoped the Association had not suffered at his hands during the year. There had been an increase in members; and, as was stated in the report, they had arrived at the century of membership. With regard to the amalgamation with the South-West Association (with which he was also closely connected), he trusted that, if it was brought to fruition, it would be for the benefit of both bodies.

### The Late Mr. John Thorman.

The President said his next duty was a painful one. Though the Association was growing in numbers, it had from time to time to submit to the loss of members; and, as the Committee's report recorded, they had suffered one recently by the death of Mr. John Thorman, the Engineer of the West Ham Gas Company. He had not the pleasure of that gentleman's acquaintance; but he knew he bore a name which had long been known and honoured in the gas profession, and had been familiar to him (the President) as long as he had been connected with gas. He moved, in accordance with their usual custom—"That the members of this Association, having heard, with great regret, of the death of Mr. John Thorman, wish to record their sense of the great loss which the Association has suffered, and their deep sympathy with Mrs. Thorman and her family in their bereavement."

Mr. J. L. Chapman (Harrow) said it was with much sorrow that he seconded the motion. Mr. Thorman had been a very useful member of the Association. He belonged to the Committee for many years, and worked very heartily with them all.

The motion was carried by the members silently rising.

### Additions to the Roll.

The Hon. Secretary read the names of the gentlemen who had been nominated for election as members. They were: Mr. J. Barton, of Peterborough; Mr. F. Clark, of Southend-on-Sea; Mr. F. W. Cross, of Lea Bridge; Mr. W. J. Dougall, of Sevenoaks; and Mr. F. Gibson, of Chelmsford.

On the motion of Mr. T. W. R. White (Sherborne), seconded by Mr. T. H. Nixon, these gentlemen were elected.

### Amalgamation of the Southern and South-West Associations.

The President said they now came to a most important part of the business of the meeting, and that was to receive the report of the Sub-Committee appointed to investigate the question of the proposed amalgamation with the South-West Association. He would call upon the Hon. Secretary to make a statement on the subject.

The Hon. Secretary said it would be remembered that this matter was shortly discussed at the last meeting; and it was then decided that a Sub-Committee, consisting of the President, the Hon. Secretary, and Mr. J. L. Chapman, should be appointed to meet a deputation from the South-West Association to consider the question. They had met three gentlemen appointed by the South-West Association—Messrs. Humphrys, Irving, and White; and he was glad to say the conference was in every respect a most cordial and satisfactory one. The report he wished to lay before the members was a short one, as he did not think it necessary to enter into the question in any great detail. They found, after talking the matter over, that the amalgamation could be effected without in any way altering the rules of the Southern Association; and the deputation from the South-West Association did not consider it necessary that the title of the Southern Association should be changed. Therefore the Committee had pleasure in suggesting that the South-West members should be taken over *en bloc* in the first place. There was at the last meeting some doubt expressed as to the expediency of this, as some members thought it might mean they would have to go farther afield for their meeting places; but he could assure them that the South-West Association were not anxious to alter their rule in this respect. What was called the spring meeting—the one they were now engaged in—had always been held in London, and always would be, he believed. The second meeting was generally held at some place in the district; and the suggestion of the Committee was that this should not be altered. The third meeting had also always been held in London; and there was no suggestion that this should be changed. It came to this, that they had to lay before the members a proposal that the South-West Association should be amalgamated with the Southern Association. The Committee, as members of the Southern, could not see any objection to this, inasmuch as it did not involve any alteration of the rules.

The President said the resolution he had to submit was: "That this meeting approves of the general principles of the suggested amalgamation between the Southern District Association of Gas Engineers and Managers and the South-West of England District Association of Gas Managers, and that the further details be left in the hands of the Sub-Committee as previously appointed."

Mr. Chapman seconded the motion.

The President remarked that he did not think it was necessary for him to add anything to the statement that had been made by Mr. Helps. It was surprising how the difficulties that had presented themselves appeared to melt away when the representatives of the two Associations assembled round one table. The deputation from the South-West Association had certainly met them at every point; and really there seemed to be no question of principle between them which was in any way reserved, or which could lead to any difficulty in the future. London would still be the "centre of gravity" of the Association; and the rules would still be, he thought he might say, the rules of the Southern Association. Upon the question of finances, the South-West representatives had met them in a most generous manner. Under these circumstances, he thought they ought not to have much difficulty in coming shortly to a determination as to whether or not they would pass the resolution.

Mr. C. E. Botley (Hastings) inquired what the resolution really meant. Did it commit them absolutely to amalgamation, or was it simply intended to express their willingness to agree to the principle that had been suggested, subject to details being arranged? The Committee had only presented their report; but they had not given any details as to what the position of the South-West Association was—financially or otherwise.

The President pointed out that the resolution said that the further details should be left in the hands of the Sub-Committee. Therefore he thought he might say it was the principle upon which they were asked to vote. But, regarding the question of details, practically there seemed no details. The subscription was the same; and the rules were almost alike.

Mr. Chapman said he quite agreed with what the President had stated. He (the speaker) was one who was perhaps a little prejudiced before the consultation between the representatives of the two bodies; but, after he came away from the conference, he was quite prepared to recommend the acceptance of the proposal. There seemed to be nothing to prevent them agreeing to the resolution, and to amalgamate at once.

Mr. W. H. H. Broadberry (Tottenham) said the whole thing seemed very simple. As he understood it, they had merely to receive the members of the South-West Association *en bloc;* and there was an end to the matter.

Mr. J. Tysoe (East Greenwich) pointed out that in the Southern Association a man must be a gas engineer or manager; and he asked whether the members of the South-West Association were confined to managers. If not, there would be some difficulty in carrying out the rules of their own Association.

The Hon. Secretary admitted that there was some little difference in the rules of the Associations in this respect. It appeared, however, that, among the present members of the South-West Association, there was only one who would not be eligible under the Southern rules. He was a gentleman who was known to many of them; and they would be very sorry to refuse him admittance to the Association. The rule governing this point in the future would be the rule governing the Southern Association now.

The motion was then carried unanimously.

The President then proceeded to read the following

### Inaugural Address.

Gentlemen,—In rising from the presidential chair of this Association to address you to-day, I realize and appreciate the honour which is conferred upon its occupant by the members of the Association, and cordially thank you again for having thought me worthy of election as your President for 1896.

There is no department of the gas industry, with the single exception of that of gasholder construction, in which more rapid advance has been witnessed of late years than the carbonizing department. As regards retort-settings, this improved condition of things appears to date from the introduction of gaseous firing, which, coupled with a greatly enlarged combustion chamber, was a truly scientific advance upon a most primitive system, and has not only effected great economy of fuel, but has resulted in an increased durability of retort-settings, which is certainly not over-stated at 66 per cent. In the furnaces themselves, wear and tear has been reduced in a far higher ratio. It is now not unusual to run beds of retorts for two years continuously, at the end of which the furnaces are found in sound condition, except on the clinker line, where a few bricks have to be cut out and replaced.

With regard to labour-saving appliances, stoking machinery, with its attendant systems of coal elevators and conveyors, is now so completely successful from the mechanical and commercial

points of view, that all retort-houses of magnitude are designed with a view to its introduction, or for the alternative and rival system of sloping retorts, which, it must now be admitted, has come to stay, and appears to compete upon equal terms with the best systems of mechanical stoking as regards economy of wages and wear and tear, while the great difference in cost of construction which was at first apparent, seems to be rapidly decreasing. The system possesses the supreme merit of simplicity, and is alleged to effect a considerable saving of space; and when it is remembered that only five years ago inclined retorts were in the purely experimental stage, the present recognized position to which they have attained warrants the belief that there is a great future before them. The stoking machinery so long associated with the name of one gas engineer—the evolution of which through hand-driven, steam, and rope systems to that of compressed air has been so remarkable—has met with a formidable competitor in the shape of the Foulis-Arrol hydraulic machinery. These machines are now working at the East Greenwich and Vauxhall stations of the South Metropolitan Gas Company, and will this year be supplied to Rotherhithe.

The gas industry is no doubt in a sufficiently expansive condition to give to the originators of these systems their due reward for many years to come; and however much gas engineers may, from motives of philanthropy, regret to see machines replace men, it is in the nature of things and inevitable that such must be the case. The gas industry, in face of the competition with which it has to contend, can no more dispense with machinery than can the thousand and one other industries of the day, for gas must continue to undersell its competitors if it is to maintain its position in public favour. Fortunately prosperous and expanding industries can, as a rule, afford both to sell cheaply and to pay good wages; and we are truly glad to know that the wages of gas-works employees are well above the general average. Some of us also permit ourselves to hope that the system of profit-sharing so successfully established by the directors of a gas company may be widely adopted by the industry, and offer to its servants generally still more attractive terms of employment.

There is one aspect of coal-conveying plant in the retort-house which does not appear always compatible with considerations of economy. I refer to the practice of dropping every ton of coals to the bottom of a store, thence to be elevated to the roof of the retort-house on its way to the retorts. In old-fashioned and narrow houses (to which stoking machinery can with difficulty be adapted), having it may be a coal-store upon one side of the house only, it may very easily be unavoidable to adopt this round-about way of feeding the machines; but surely in designing a retort-house, it is likely in the long run to be cheaper to build it of sufficient width for the erection upon the stages of the ordinary coal hoppers or bins, from which the coal can be elevated direct to the charging-hopper at any point of the machine's progress along the stage by an elevator attached to the machine. This has been done, I believe for the first time, at the Vauxhall works, in conjunction with an installation of hydraulic machinery; and it has been determined upon for a reconstructed house at Rotherhithe in connection with the same machines. Apart from difficulties attaching to the construction of the house or position of the coal-store, the system of elevators and conveyors from the store arose, I am aware, from the necessity of breaking the coals for machine charging. But this difficulty is practically non-existent in the hydraulic system; and if conveying plant can be dispensed with, a great saving in working—if not in first cost—will follow.

But, after all, these constructive improvements and mechanical appliances, however well fitted for their purpose, serve, by way of contrast, to emphasize the fact that they have been attended by no corresponding advance in the practice of carbonization from the point of view of the chemist, though it would be rash to say that no improvement in quantity and quality of gas per ton of coals has followed their adoption. The most suitable temperature for carbonizing (say) Newcastle coal has not been discovered; and little is known beyond the initial temperature necessary to distil a given weight in a fixed time. Constant temperature, or anything approaching it, cannot obtain under present static conditions. However hot the retort, an immediate and heavy fall in temperature must follow the introduction of the charge, to work up again to its maximum in the allotted period. The consequence is a spurious fractional distillation, of which the one extreme is found in the tar-well and the other upon the surface of the retort, whereby the product of distillation has been impoverished at each end of the scale, which, commencing with condensable vapours, has run through the whole gamut to dissociated gases and the deposition of free carbon.

The difficulty is so clearly apparent—it has been so often commented upon, yet still seems so far from practical solution—that it were almost waste of time to allude to it to-day, had it not been recalled to our minds by a suggestion recently appearing in the columns of the "JOURNAL OF GAS LIGHTING," to the effect that the question of the carbonization of coal in bulk deserves consideration. While such a system would not overcome the difficulty, and might possibly increase it, its adoption would amount to a practical admission of the fact that the evils consequent upon variable retort temperature cannot be overcome in horizontal retorts containing coal at rest; and that improvement from the chemist's point of view must be sought in quite other directions. Nevertheless, if any data exist warranting the belief that the gas made per ton of coal carbonized—for the production of metallurgical coke in the first place, and secondly for liquid bye-products—in 48-hour charges of 5 to 6 tons is not greatly inferior in quantity and quality to that obtained from six-hour charges of 6 cwt., the question deserves very thorough investigation; for there can be little doubt that the adoption of such a system would effect considerable economy of capital, repair and maintenance, and wages. It is therefore to be hoped the matter will not be allowed to drop.

As regards the synthetic and dissociative changes, due to varying temperatures in the retort, upon the ultimate result of which the average luminosity of the gas depends, it will, I think, be readily conceded by gas engineers that their knowledge is chiefly derived from sources outside the profession itself. Investigations into these complexities must be carried out by chemical experts, and cannot, I believe, be effected apart from considerable expense. Nevertheless such inquiries have been undertaken by some of the ablest men of the day, by whose labours the gas industry has greatly benefited. For instance, Professor V. B. Lewes has proved by experiment that, between 1500° and 1600° Fahr., ethylene is broken up into acetylene and methane, with formation of benzene; and that if the temperature be further raised to 1832° Fahr., higher bodies (among them that blessing in disguise, naphthalene) are formed, which at about 2000° Fahr. again break down to acetylene, which then decomposes into carbon and hydrogen. Again, the Professor has told us that all experimental evidence shows that benzene is formed from acetylene, and this at temperatures existing in the oil-gas retort. Professor Mills, of Glasgow University, has also said that benzene can be obtained by keeping acetylene for a long time just below a red heat.

The difficulty is that the hydrocarbon vapours of the benzene or unsaturated series, which are of far higher value as illuminants than any of the permanent gases of the paraffin or saturated series, undergo dissociation as the temperature of the retort rises to its maximum. At the same time, an enormously excessive quantity of naphthalene is produced, which, apart from the nuisance of matter deposited in the wrong place, constitutes a lamentable waste of carbon which has existed in the gaseous or vaporous form; for it must not be forgotten that naphthalene vapour is by far the most valuable illuminant which the gas carries—comparing, as Professor Lewes has told us, with benzene in the ratio of 900 to 500 candles per 5 cubic feet of vapour. Fortunately some naphthalene appears to be formed at all temperatures above a red heat; and the problem for us is how to produce less and retain more of it than has hitherto seemed possible.

With regard to condensation, that branch of purification falling within the domain of physics rather than that of chemistry, it does not appear that the profession owes anything to outside sources beyond the knowledge gained indirectly from the results of tar distillation. The condensers are certainly that portion of the equipment of gas-works about which least is heard, and in which least interest is apparently taken; and yet it may be, or it may not be, that changes greatly affecting luminosity are taking place as the gas flows from the hydraulic main to the exhauster, cooling, and therefore contracting in volume, and in consequence depositing suspended matter, though neither so soon nor so completely as might perhaps be expected. Perhaps the apparent lack of interest in the subject is due to a feeling that condensation is a necessary evil inevitably resulting in the removal of a considerable quantity of luminiferous hydrocarbon vapours—the loss of which has to be made good by processes of enrichment.

In the direction of enrichment, there has of late been very marked advance; and it is in connection with such processes (so it seems to me) that the study of the physical conditions under which hydrocarbon vapours exist in coal gas has acquired fresh interest, which will probably be followed by closer attention to the subject of condensation. A distinction between so-called permanent gases and vapours we know to be in reality unscientific, since it is rather a difference of degree than of kind so long as the vapours are unsaturated; and therefore any prejudice which may perhaps have at first attached to the notion of adding vapours to gas, has passed away. The practice is seen to be scientifically sound, since vapour is known to be the chief source of the original luminosity of the gas.

Hydrocarbon vapours exist in coal gas as a most complex mixture of bodies, differing widely in density and tension; and the total tension or pressure of the mixture is not the sum of them all *plus* that of the gas, but the pressure of the gas *plus* a balance or equilibrium of vapour tension, due, as we learn from the text-books, to the fact that the vapours partially dissolve one another. This common tension, it appears, is always above that of the most inert, and below that of the most volatile constituent of the mixture; and hence it is that some of the most valuable illuminants—notably naphthalene—being vapours of bodies of high boiling-point exist in the mixture as it were on sufferance, in quantities larger than temperature would admit were it not for the aid of vapours of higher tension, which part with some of their own elasticity to increase that of their neighbours. The question of saturation is a very large one, but of the greatest interest and importance to the gas maker. Given the tension and density of a vapour, the quantity which will saturate a space of 1000 cubic feet filled with gas or *in vacuo* at

a given temperature may readily be calculated; and the matter would be simple enough were one vapour only—say, that of benzene—present with the gas. But, as just stated, coal gas contains a mixture of vapours partially dissolving one another. To this, if we add another vapour—say, that of carburine—we upset the balance. A new common tension will result; and if the volume added is in excess of the quantity required to saturate the gas, liquid will be deposited.

What will be the composition of that liquid? Will it be identical with that of the mixed vapours, or will the lighter vapours have pressed out the heavier? If the latter be the case, not only will enriching material have been wasted, but in all probability the gas will have been actually impoverished by the removal of a heavy vapour to make room for a light one of lower photometric value. That such a process of substitution occurs if coal gas is made to pass through a light hydrocarbon in the liquid form, was shown by Mr. G. E. Davis, of Manchester, about ten years ago; and we may probably safely conclude that a similar result will follow supersaturation.

As regards the quantity and quality of the vapours existing in purified coal gas, the same chemist found, in 1884, that he could dissolve out of Manchester gas from 3·7 to 4·25 gallons of liquid per 10,000 cubic feet, which, upon analysis, was found to contain upwards of 80 per cent. of hydrocarbons of the benzene series; and Mr. Wilfrid Irwin has recently stated that from 10,000 feet of Manchester gas he obtained, in 1882, 3·5 gallons of benzene. It appears by calculation that, supposing these mixed vapours to possess a joint tension as high as that of benzene, the gas would carry at the freezing-point and atmospheric pressure 8 gallons per 10,000 feet, or twice the quantity found. But Mr. Davis asserts that the joint tension is very much below that of pure benzene, which we can hardly doubt. Nevertheless we know that purified gas is not saturated at ordinary temperatures by the quantity which it carries—say, 0·4 gallon per 1000 feet—because every day we are adding to our gas a considerable quantity of vapour, which is not deposited on the works or in the district mains.

If alongside of this fact of non-saturation, we place another—viz., that, by processes of distillation, vapours precisely similar to those which the gas carries are extracted from the tar—two questions of great interest present themselves: "Why, since the gas is unsaturated, are the vapours thus divided however unequally between the gas and the tar?" and "How can we retain as vapour in the gas that which we now lose in the condition of liquid?" In attempting to answer these questions, we shall probably conclude that "solubility" is the chief difficulty with which we have to deal in condensation. It has been asserted that a smaller quantity of these light hydrocarbon liquids is now obtainable from the tar than was formerly the case. If so, it is very desirable that we should discover whether there is now more or less vapour in the gas. The fact—if fact it be—is, I think, sometimes taken to be evidence that the volume of vapour in the gas has been correspondingly increased; but I am not aware that this has been proved by any investigation similar to that adopted by Mr. Davis. Evidence upon the point would be of great value as affecting questions of retort temperatures and of condensation.

Assuming the gas to be richer and the tar poorer, is the improvement due to processes of condensation? Has any new departure in condensation been effected of late years? Apparently there has been one only—viz., the early and persistent removal of tar from contact with the gas. In the hydraulic main, precautions are taken to maintain a liquor seal; and not seldom a perforated plate is fixed in the hydraulic main, to bring about, among other results, the separation of tar by friction. In the condensers, the gas has to be cooled gradually to atmospheric temperature, that it may be reduced to normal volume before reaching the exhausters, and to bring it into fit condition by deposition of its suspended matter for washing and scrubbing processes. Cooling is a comparatively simple matter, and is mainly concerned with questions of surface and speed; but mere cooling by unobstructed flow through pipes or chambers will not deprive gas of the whole of its suspended tar—its complete removal being only effected by means of friction.

Here we meet with a practical difficulty, the reality of which has, perhaps, only lately been fully recognized—viz., how to make use of friction in condensation, and at the same time to avoid that considerable discrepancy between the vacuum in the engine-house and that in the hydraulic main which leads to infiltration of air, and possible serious consequences to illuminating power and purifying processes. That friction is necessary for complete removal of tar is well known in the shale industry, where tar is the staple and gas the residual product; but friction, whether due to pipes of small diameter or deliberately brought about by offering obstructions to the flow of gas in the form of perforated plates, is friction still, and the exhaust must be increased to overcome it. There does exist a radical cure for the infiltration difficulty, about which we heard something last autumn; but we shall probably wait for further information from the author of that interesting communication before we decide upon placing our condensers on the pressure side of the exhauster.

At Rotherhithe, where, for a maximum of 5 millions, the surface is 6·76 square feet per 1000, and the speed is 655 feet per minute at the inlet and outlet of the slow-speed condensers, the final removal of tar is not effected until the gas reaches the washers. At the outlet of the exhauster, the gas still carries with it a tar-mist, rendering it faintly visible, which only disappears at the outlet of the first washer. It is surely desirable to relieve the washers of this purely mechanical function, which must greatly hinder their efficiency as purifiers.

The late Mr. John Somerville advocated the employment of perforated metallic discs in the foul main for the frictional removal of tar, and adopted them at Bankside; and so long as the temperature is high (say, above 90° Fahr.), there is little risk of clogging; the tarry particles being simply thrown down. This method appears to be commonly employed in Continental gas-works, in the form of the Pelouze apparatus, the use of which in the retort-house itself was distinctly contemplated by its inventors. This anticipation of the mechanical function of the washers at so early a stage in condensation must, I think, bring about the very result claimed by Mr. Somerville—viz., an increased illuminating power due to the retention of naphthalene vapour, together with those light vapours which carry it, which would otherwise have been dissolved out by the tar.

The operations of scrubbing and washing have probably some adverse influence upon luminosity, particularly the water scrubber, since water has a solvent action upon some of the permanent gases as distinguished from the vapours. These processes, however, can now be effected in highly specialized and well-designed apparatus, which by employing strong liquors, attain greater purifying efficiency, and by requiring a smaller quantity of clean water, probably reduce the deleterious effect of washing and scrubbing on illuminating power to a minimum.

I have, I fear, been tempted to dwell at too great length upon the kindred subjects of vapour tension and condensation, because during the past three months experiments have been made at Rotherhithe with a view to put some of the foregoing theories to a practical test. The results have been surprising; and as the experiments are perhaps somewhat novel, they may be of interest to you.

The papers by Mr. G. E. Davis before referred to, show that the liquid which he obtained from Manchester gas must have possessed an enrichment value of 4500 candles per gallon. Now the highest value which has been assigned to the light hydrocarbon liquids in constant use—say, carburine, gasoline, benzol, &c.—is about 1600 candles per gallon. In water-gas manufacture, 1400 candles per gallon has not, I believe, been exceeded; and the Peebles oil-gas process claims 1750 candles per gallon—the two latter employing a cheaper and heavier oil. Professor Lewes has stated that the liquids condensed by compression in the Pintsch and other oil-gas processes have an enrichment value of about 3000 candles per gallon.

The Manchester figure is therefore somewhat startling; and the Rotherhithe experiments have aimed at its reproduction. They have been successful—that is to say, an enrichment effect of 4500 candles per gallon and upwards has followed, though not invariably, from the employment of some of these and other liquids under new conditions. Briefly, instead of evaporating them into the gas at the outlet of the purifiers, they have been added at two points in the condensing plant. In each place, the liquid has been evaporated in the usual way, and carried by a current of gas into the main stream. The points have been: (1) The foul main in the retort-house, where in the winter the temperature averages 110° Fahr. (2) The inlet of the slow-speed condensers, where the temperature has fallen about 45° Fahr. and naphthalene when deposited remains undissolved. Under these conditions, the vapour has to run the gauntlet not only of more or less of the condensing plant, but of the whole of the washing, scrubbing, and purifying plant in addition.

Results show that the vapour survives and carries along with it to the burner something, presumably vapour of naphthalene, which would otherwise be lost, reducing the quantity of liquid required per candle per 1000—viz., for 200 candles—to ¼ gallon per ton; a far smaller quantity than has before, I think, been found sufficient in the evaporative process. It should be added that, while the vapour introduced at the foul main does not appear to be lost, its enrichment effect is far less than when added at the inlet of the slow-speed condensers, where the speed is reduced from 655 to 236 feet per minute. It seems, therefore, that to obtain the best results vapour should be added at that point in the condensing plant where naphthalene comes down, and remains undissolved by tar.

These experiments have necessarily all been upon a working scale of quantities ranging from 160,000 to 200,000 cubic feet per hour.* They are at present far, very far, from complete. To what extent, if at all, they may ultimately lead to modification of views regarding condensation and enrichment, it is too early to determine. It may possibly be found that the candle after all is not worth the game. But the facts are as stated; and I should be highly gratified were any member of this Association to think the matter worth investigation, because local circumstances so often alter cases.

The experiments, so far as they have gone, seem to show that the luminosity of gas from Newcastle coal is largely dependent upon the quantity of naphthalene vapour retained by the solvent action of other and lighter hydrocarbon vapours. (It may be noted that Mr. Davis found his liquid to contain nearly 12 per cent. of bodies having boiling-points above 290° Fahr.—among

* Mr. Browne added, when reading his address, that the experiments had extended over from 15 to 16 million cubic feet of gas.—Ed. J.G.L.

them naphthalene.) They indicate that the deleterious action of washing and scrubbing upon illuminating power due to vapour is trifling; and they support the opinion that the real enemy to luminosity is tar, by reason of its solvent action upon naphthalene and other vapours. They may perhaps also tempt us to speculate upon the possibility of retaining sufficient naphthalene now going to waste to greatly reduce the cost of enrichment, with, perhaps, an appreciable effect upon the naphthalene nuisance in the works and in the consumers' service-pipes. If it should be found that coal gas can be economically enriched in the condensing plant, I am of opinion that oil gas would prove the cheapest and the most suitable agent for the purpose; and to those members of this Association who are fortunate enough to possess an oil-gas (or even a water-gas) plant, I would suggest the experiment of mixing their gases at that point in their condensers where naphthalene accumulates. I think that the result would surprise us.

Before a system of purification by lime can be said to be economically or wastefully carried out at a given works, it should be inquired whether, from local circumstances, comparatively more or less is required of it. This is perhaps sometimes forgotten. An advantage enjoyed by the larger companies consists in the opportunities afforded them for purposes of comparison between different works leading to the detection of local defects or difficulties. For instance, the South Metropolitan Gas Company has six manufacturing stations. Upon an occasion, simultaneous experiments of a week's duration were called for to determine the quantities of carbonic acid and sulphuretted hydrogen in the gas at the outlet of the exhauster and the inlet of the lime purifiers respectively. The returns showed considerable differences at the first point. But the variation was still greater at the inlet of the purifiers; showing at once that washing and scrubbing were more efficient at some works than at others, and serving, at least partially, to explain why the consumption of lime at the various stations did not more closely correspond. The greater affinity of carbonic acid for ammonia manifested in precisely the same way as its greater affinity for oxide of calcium—viz., by displacement of sulphuretted hydrogen—is a fact which should lead to the employment of the strongest liquors in the most efficient washing and scrubbing plant, with a view to the relief of the lime purifiers.

With regard to the best method of lime purification, there now seems to be very little room for differences of opinion. That known as the sulphide system—in which calcium sulphide is prepared in separate vessels, set apart for removal of sulphur compounds, and isolated from the processes for extraction of sulphuretted hydrogen and carbonic acid—has been proved to require greater capital expenditure, to be less reliable in operation, and to be productive of nuisance; while that known as the rotation system has been found cheaper in first cost, to possess greater certainty in action, and to avoid nuisance. Moreover, it is in connection with the latter that a saving in lime has been found to follow the introduction of oxygen or of atmospheric air to the purifiers.

Given a good quantity of sulphuretted hydrogen—say, 500 grains per 100 cubic feet—entering the purifiers, the difficulty is not so much the chemical problem of the removal of sulphur compounds as the economic one of completely carbonating the lime. While the first is, in my opinion, mainly dependent upon a good supply of sulphuretted hydrogen, the second seems only attainable by employment of the air process. Air, or oxygen, being driven into that box—say, No. 3 or No. 4 in the series—which is freely absorbing sulphuretted hydrogen, while carbonic acid is either absent entirely or present in very small relative quantity, a less stable combination between the lime and the sulphuretted hydrogen follows, from which the latter is more readily expelled by carbonic acid. By thus limiting the ultimate duty of the lime to the breaking up of sulphur compounds and absorption of carbonic acid, economy is effected; while surplus sulphuretted hydrogen being driven over to the oxide purifiers becomes a source of revenue. That these results follow the introduction of air in measured volume to lime purifiers, has been my experience; and I am so far a convert to the views upon this subject, with which, among others, the names of Mr. C. Hunt and Mr. C. C. Carpenter have been so conspicuously associated, together with those of Messrs. Hood and Salamon as professional chemists.

I regret to be unable to go farther. It is not our experience at Rotherhithe that the removal of sulphur compounds is rendered more certain by the use of air at the points mentioned and in measured quantity of 1 to 2 per cent. This may be due to the fact that at Rotherhithe more sulphuretted hydrogen enters the purifiers than, from the experiments mentioned, there is reason to believe is the case at other works of the Company, where the use of air has a marked effect upon sulphur compounds. I can, however, say that the small quantity of air introduced does not impair the efficiency of the Rotherhithe purifiers for dealing with sulphur compounds; that it does not have an appreciable effect upon the illuminating power; and that it is therefore employed from general considerations of economy. But it must be added that in an experiment of several weeks' duration, in which, for purposes of comparison, air has been driven into one set of purifiers but not into the other, the efficiency of the one set for removal of sulphur compounds has been practically identical with that of the other.

I fear that at a meeting of the Southern Association, this must sound like heresy; and it will probably be said that sufficient air enters the vacuum mains to bring about the necessary condition of things in the purifiers. It may be so. It is not denied that some air enters in this backstairs manner; but it can at least be said that precautions are taken to reduce the quantity to a minimum.

At this point, I find that my remarks have reached the limit which time permits, although very few of the topics usually dealt with on these occasions have been touched upon. If, however, some very brief reference to present circumstances of the gas industry and of the Southern Association can be permitted, I will, as regards the first, content myself with recalling to your minds two remarkable statements appearing in the "JOURNAL OF GAS LIGHTING" of the 4th inst. The first is a clause in the half-yearly report of the South Metropolitan Gas Company referring to "the continued extraordinary development of the demand of weekly tenants, who with scarcely any exceptions did not use gas until the introduction of the penny-in-the-slot, or automatic or coin meters," of which 10,616 had been fixed in the half year, together with 8731 small gas cooking-stoves; bringing up the grand total of coin meters and small stoves fixed to Dec. 31 last to 42,949 and 29,548 respectively. The second is a statement by Lord Claud Hamilton at the half-yearly meeting of the Great Eastern Railway Company, in which he roughly estimated that 100,000 tons less coal had been carried by the railway "in consequence of the extended use in the whole of the suburban districts of gas-stoves and stoves heated by oil." The statement as reported is not very precise; but such an admission by the Chairman of a great railway company, shows the direction in which the tide is flowing, and constitutes a very valuable piece of unprejudiced external evidence in support of the policy which offers to the consumer of gas in every class of the community every possible inducement, whether of price or apparatus, to use gas both as a fuel and as a source of light. Wherever such a policy is pursued, there seems no reason to doubt that gas will continue to hold the field against its competitors.

In connection with the amalgamation proposal now under consideration, the subject of the prosperity of this Association acquires enhanced interest. That prosperity continues unabated. Our numbers now exceed 100; our meetings are uniformly well attended and successful; and our Honorary Secretary is well supported by the members in his efforts to maintain the technical record of the Association. The causes of this happy condition of things may not be far to seek; but among them is one for which the members cannot take credit to themselves, since it is geographical, and consists in the fact that London is the centre of gravity and head-quarters of the Association. This was fully recognized and admitted when the proposed fusion was under discussion last autumn; and it appears to be the dominant fact of the situation. Even if every other difficulty could be surmounted, this natural advantage is seen to be of too real value to be surrendered. In dealing with the question, the interests and welfare of the Southern Association must surely be paramount in the minds of its members.

Mr. R. MORTON (London) proposed a hearty vote of thanks to the President for his address, remarking that, if it was an indication of the way in which he would apply himself to the conducting of the business of the Association during his term of office, they would have no reason to say at the end of it that they had done wrong in electing him to the position.

Mr. C. C. CARPENTER (Vauxhall) seconded the proposal. It had been a great delight to him, and he was sure it must have been so to the other members, to listen to the address. It contained the kernel of two or three good papers; and he hoped the President would be prevailed upon to continue his researches in the directions he had indicated, and give papers upon them.

The motion was agreed to by acclamation.

The PRESIDENT said he could not adequately express his thanks for the kind way in which the motion had been received. There was no one who was more ashamed of the address, or felt how far short it fell of what it should be, than he himself. If, however, it had any claim to their attention or respect, it consisted in the fact that he honestly tried to produce something that fell within the range of his own experience, and which had necessitated some hard work at Rotherhithe over and above that which was required by his daily duties.

After a short interval, the members and a few friends dined together; and, in the course of the toast list, the enjoyment of the evening was heightened by music and song.

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**"Flicker" Photometry of Coloured Lights.**—In the current number of the "Physical Review" of New York, Mr. F. P. Whitman gives some account of the use of the "flicker" photometer in comparing lights of different colour. He states that this method approximates in convenience and accuracy to any of the ordinary photometric appliances in which lights of the same colour are employed. The chief test by which this conclusion is arrived at is that different observers whose vision is normal obtain similar results; whereas by other methods the comparison of coloured lights by different observers was found to give results often differing by as much as 50 per cent. The flicker method of photometry is based upon researches made by Professor Rood.

## MIDLAND ASSOCIATION OF GAS MANAGERS.

The Nineteenth Annual Meeting of the Association was held last Thursday at the Grand Hotel, Birmingham. There was a large attendance of members. Mr. W. R. COOPER (Banbury) presided; and, in opening the proceedings, he remarked that he was pleased to be present on the anniversary of the Association, and gave all the members a hearty welcome.

The HON. SECRETARY (Mr. C. Meiklejohn, of Rugby) read the minutes of the last meeting, which were confirmed.

The report of the Committee, accompanied by the statement of accounts, was then presented. In the former, the work of the Association during the past year was briefly reviewed, and the announcement made that five new members had joined the ranks. The names of three members had, however, been removed from the roll under the rules, and three others owing to resignations. The accounts showed a balance in hand of £79 17s. 9d. The Committee closed their report by thanking the members who had contributed to the proceedings, and by soliciting a continued and increasing interest on the part of the general body in the technical work of the Association.

On the motion of Mr. B. W. SMITH (Smethwick), seconded by Mr. J. S. CRANMER (Stratford-on-Avon), the report and accounts were adopted.

The HON. SECRETARY reported that four new proposals for membership had been considered by the Committee; and they recommended for election: Mr. Henry Percy Maybury, Local Board Offices, Great Malvern; Mr. William Charles Jones, Gas-Works, Kingswinford, near Dudley; Mr. Alfred Henry Ward, Gas-Works, Bromyard; and Mr. William Moult, Gas-Works, Rugeley, Staffordshire.

On the motion of Mr. W. NORTH (Stourbridge), seconded by Mr. B. W. SMITH, these gentlemen were elected members.

Mr. J. T. LEWIS (Wellingborough) proposed, Mr. GEORGE WINSTANLEY (Coventry) seconded, and it was resolved that the volume of "Reports of Gas Associations for 1895" be presented to each member not in arrears.

The PRESIDENT, who was heartily applauded, then delivered the following

### INAUGURAL ADDRESS.

Gentlemen,—It is with diffidence that I address you this afternoon from the presidential chair of the Midland Association of Gas Managers, most of the members of which are far more conversant with the routine of a gas-works than myself. While thanking you for the honour you have so kindly conferred upon me in electing me to be your President for the current year, I can assure you that I am not forgetful of the obligations and responsibilities connected with the office; and I will try to discharge them faithfully and zealously until my successor shall have been elected in my stead.

I must crave, and feel sure that you will grant me, your indulgence, if in the course of my address I deal only with general things, and do not treat of anything that can be considered new and startling; for in these days of so many weekly and monthly issues of gas literature, and such a number of Associations, it is almost impossible for me to tell you of any new thing, or polish up any old one so that it may answer the purpose for which this Association exists.

The daily duties of a gas manager like myself are so many and varied that the thousand-and-one questions which from time to time arise and claim his attention allow him little leisure for making experiments or studying modern ideas, and often preclude him from doing as he could wish to do in carrying out valuable suggestions, because the necessary time and funds are not always at his disposal. Yet, personally, I have much to be proud of, as my Directors have always been to me more friendly than dictatorial; and we have worked together with that kind harmony and confidence which is so essential for the lasting good of the Company and the peace and well-being of the Manager, so that he may be able to take a deep interest in all that devolves upon him, and keep himself ever fresh in the spirit of inquiry.

The manufacture of gas has been one of progress; and to popularize it is a step towards the diminution of smoke and dirt, and an addition to the comfort and refinement of the several classes of the community who receive our daily care and attention. The gas engineers of to-day are workers in a comparatively modern industry. Mr. Thomas Newbigging says the manufacture and distribution of coal gas may be justly described as one of the important industries of the world. Like railways and the electric telegraph, it is a product of the nineteenth century; and I make bold to add that we are not only of modern birth, but also of strong and rapid growth.

The lot of your President has been cast in small works; and he feels quite unable to speak as he could wish to some of the members of this Association, and so casts himself upon their kind indulgence while he addresses most of his remarks to those who, like himself, are situated in somewhat isolated and thinly-populated districts.

What a change has come over gas manufacture since some of us first became acquainted with it! In my own experience, it is marvellous. I can look back sufficiently far to remember the days of iron retorts, and the retort-house as a kind of sacred ground over which the eyes of the curious public could not be permitted to gaze, and when it was considered a great favour for a brother manager to be permitted to pass beyond its borders. But, thanks to the kind and friendly feelings which our parent and district Associations have engendered, we are now welcomed where formerly we were rejected; and gas managers the land over are only too pleased to see friendly faces, to greet each other hand-in-hand as brothers, and to compare notes, exhibit works, and further each other's interests.

When I bring to mind my early recollections of the retort-settings, it affords me some amount of amusement to think of the 12-inch iron retorts set three in a bed, and having 3-inch ascension-pipes, 2½-inch bridge-pipes, and 2-inch dip-pipes attached to a circular hydraulic main constructed of common 15-inch socket and spigot main-pipes fixed in one continuous length, and standing half full of tar, which was cleaned out once a year. The dips were set 3 and 4 inches deep in tar in places where the main had subsided, and assumed a kind of festoon design as it adapted itself to the irregularities of the brickwork upon which it rested; and the whole of that depth of seal, together with the pressure from the gasholder, had to be overcome by the retorts, as exhausters in those days were luxuries enjoyed only by the few. The volume of gas produced was the satisfactory quantity of from 6500 to 7000 cubic feet per ton of coal carbonized, with very little coke for sale, because most of it was consumed in heating the brickwork of the settings. The furnaces were little better than so many coke-destructors—distorting and melting the retorts set over them.

It is not my intention to occupy your time by dwelling at any length upon the manufacture of coal gas in each of its details, but only in a few of them; for when I consider to whom my remarks are addressed, I feel utterly unable to speak with anything like satisfaction to myself, or in a way that would prove materially instructive to this highly influential Association.

I will ask you to first kindly consider with me the heating of retorts. It is gratifying to observe that considerable progress is being made in the method of heating retorts by regeneration, or by a more simple and inexpensive means of introducing secondary air to the furnaces. Not only is this being done in large works, but also in smaller ones. Whatever system can show the most favourable results on the year's operations must, of necessity, carry the day; and so the gas manager must be alive to every improvement which promises a saving of expense, or an increase of production, so that he may leave far behind him all previous records, and secure for himself something better. The production of 4000 cubic feet per mouthpiece per 24 hours must give way to 8000 cubic feet; and the 9000 cubic feet of gas per ton of coal carbonized, to 10,500 or even 11,000 cubic feet. In many cases, the latter production will be the better and purer quality. How important it is that every gas manager should have his directors working in harmony with him, so that he may be able to introduce the most modern and scientific systems of working into his retort-house, in order that he may start fair, and be able to give a good account of the coal which is supplied to him, and the wear and tear of the most important portion of his workings; for, in my opinion, nothing militates so much against the interests of a gas company as having improper apparatus.

On the general question of carbonizing, there cannot be any doubt that some system of scientific firing should be adopted; and if it is a fact that the combustion of fuel by regeneration is more perfect than by the ordinary method, there ought to be a practical means of carrying it out in such a manner as to make it acceptable and profitable in both large and small works. The mere saving of a few tons of coke as fuel is not a serious question with some of us; for, as we advocate gas for heating and cooking, we bring ourselves into competition with our own coke, which we are bound to dispose of. Therefore it has to be settled whether the amount of fuel to be saved will be of such value as to justify the expenditure for the introduction of the complete regenerative system. The opinion of many gas managers is that it is not; while many others are equally strong in the opposite opinion. But each manager should study his own special conditions, and introduce such modifications of the principle as are capable of adoption, and thereby effect economy which may lead on to completeness. I feel certain that much of what has been said derogatory to the system is the outcome of the unsuccessful results obtained from the expensive settings erected some years ago, the costliness of which has, in the opinion of most men, been equalled only by their apparent worthlessness.

My own experience is that gaseous firing, properly applied, is the most efficient, economical, and scientific method of heating retorts. The old system of open fires is crude and unscientific; and the new one only requires to be understood and fairly dealt with in order to become a much more useful and better servant to gas managers than the old system ever can be. It needs no words of mine to picture to your imagination the results of greatly increasing the lives of the retorts; and this can, and is, being done by the adoption of gaseous firing. The retort-house must command the greatest share of our attention; for it is a fact that the best results are only to be obtained by a close attention to its details. By keeping the retorts, furnaces, and arches in first-class order, we reduce leakage, save fuel, and lessen the amount of renewals from year to year.

Some short time ago I visited a gas-works which carbonizes not more than some 800 tons of coal per annum upon the

regenerative system; and the manager spoke of it in the highest terms of praise. His retort-house appeared to be economically arranged, and, to my mind, was a little model. I hope those of us who believe in the system of gaseous firing will not be discouraged by the failures which have taken place; for undoubtedly the system is excellent, and must ultimately become, in part if not in whole, the only system of carbonizing in well-managed gas-works. Many of us have made the mistake of thinking that so long as the retort was hot it was satisfactory, and all that was needed for the proper carbonization of coal; but to-day we are solving the problem of having high and regular heats without their attendant evils.

I have occupied considerable time in speaking of the retort, because it is of the first importance in gas-works; and good or bad results obtained from it affect the general results of the year's working. Be the works never so complete and beautiful, if either the retorts or their working be neglected, the result will certainly be unsatisfactory.

What about the condenser? Is our general system of condensation a correct one? We all know that the gas must be condensed. But it is possible to do too much or too little; and what may be correct for one hour of the day may be altogether wrong for the next. Hence the difficulty. I am patiently waiting for the day when this vexed question will be thoroughly settled, and a system introduced whereby we shall be able to condense, wash, and purify coal gas in closed vessels entirely, these vessels to be sufficiently under control to enable us to adapt the plant to meet the requirements as they vary from hour to hour or day to day. Those of us who visited Belfast in 1893 well remember the large pile of apparatus in use at the gas-works there for purifying gas in closed vessels; and from what we could then learn, we were not impressed with the idea that the system was a satisfactory one or an accomplished fact.

I experience some difficulty in speaking of the temperature to be maintained in the condenser; in fact, I have been assured that the temperature should not in any way be considered in the purification of coal gas, and that if the condensers possess the quality of being able to lower the temperature of the gas to that of the atmosphere, they should be considered to be efficient. The purpose of the condenser, as I understand it, is to extract or arrest the tar from the gas while condensing it. But some managers contend that we should remove all the tarry matter from the gas while it is warm, and before we pass it into the condenser; leaving the coolers or condensers to do their own work. The question as to what temperature it is best the gas should leave the condenser at is still unanswered; and upon it there is a great diversity of opinion. If a higher temperature is better than, or as satisfactory as, a lower one, then a few pipes are all that is needed. I am inclined to agree with the advocates of the higher temperature, where the scrubbing and washing is fully provided for. I know a gas-works in an adjoining county where water at 70° Fahr. is pumped into the washer and scrubber, and very good results are obtained; and the gas is fully condensed before it reaches the station meter. If it is not necessary to cool the gas to the temperature of the atmosphere at the condenser, it is not wise to spend money or power on that which is unnecessary.

My experience with regard to condensation is that you cannot depend upon the ordinary amount of cooling surface alone for freeing the gas from tar. The gas requires to be obstructed or broken up. Many years ago, I inserted obstructions of various kinds in my foul main; but finding that the tar was still troublesome and going forward, I procured two scaffold-poles, and studded them with a quantity of nails and hooks sufficiently long to stand out from the poles to a distance corresponding with the diameter of the pipes forming the foul main. I then pushed the poles into the foul main, and was pleased to find how very effective that simple contrivance was for arresting the tar. Some years later, I obtained a Livesey washer, but was greatly troubled with the tar clogging up the small perforations in the plates. To obviate this, I placed in two of the pipes of my condenser some wooden discs with square holes varying from 4 to 8 inches (for use according to the season of the year); and between them, at a distance of about 4 inches, I fixed some grids constructed of 1-inch and ¼-inch iron bars, set ⅜ inch apart, so that the whole of the gas as made is forced through the hole in the wooden disc, and impinges upon the iron grid. This causes sufficient friction to arrest the tar, and thereby relieves the washer of any clogging, and permits it to work most efficiently, with a more or less constant froth upon the surface of the liquor, which greatly assists the washing process. These simple contrivances have proved themselves valuable to me; and the arresting of the tar from the gas before it passes on to the various washers has saved me much trouble and annoyance.

It is very interesting to read the many opinions of some fifty gas engineers who, in 1882, gave their experiences in reply to questions sent out by the Research Committee of The Gas Institute—some of them appearing as though they were in direct opposition to those expressed by neighbours. The report states: "As to temperature of condensation, some of the returns point to a distinct gain in illuminating power by maintaining the temperature of the gas at the outlet of the condensers *above* that of the atmosphere in cold weather; but it is not made clear as to whether, or how much of, this advantage is subsequently lost during storage and distribution. This much seems evident, that the loss, if any, is more appreciable in the case of cannel gas, or of gas made largely from cannel or bituminous shale, than in that of common gas; and the same observation applies to loss in distribution apart from condensation. It has, however, been impossible to determine this point with accuracy from the returns; and the Committee are of opinion that a series of experiments bearing upon this branch of the subject is greatly to be desired."

The open-air or pipe condensers will do their work fairly well, provided they are properly and carefully managed, and of sufficient capacity, with a few simple obstructions placed in them; otherwise the results will be of a fluctuating and unreliable kind. With a regular make of gas, the cooling will be much less or much more on some days than on others, because the condensers are exposed, more or less, to the great and ceaseless variations of temperature—to rain, wind, sunshine, frost, and snow. Therefore it will be advantageous to protect these condensers by a covering of some kind, which would greatly neutralize the effects of varying temperature, and thereby allow of the operations being carried on at a more even temperature.

The difficulty experienced by many of us of insufficient condensers allowing tarry matters to be carried forward to the washers or scrubbers, thereby seriously affecting the purifying power of the latter, need be a difficulty no longer, as excellent apparatus, produced by several engineers, completely supplies the want; and we are to blame if we neglect to avail ourselves of their assistance. I am pleased to learn, from testimonials published in the "JOURNAL OF GAS LIGHTING," that our friend Mr. Charles Hunt, of the gas-works of this city, has patented a washer that will do its work most successfully, and clean the gas even when it is largely charged with tar in consequence of inefficient condensers.

Presuming that the gas has been well washed and scrubbed by means of one or another of the many forms of apparatus submitted for our selection, and constructed and worked upon such sound principles, I will ask you to kindly bear with me for a time while I submit to you some of the varied ideas upon, and processes for, the purification of coal gas held and adopted by a few of the honoured men of the past, as well as by those who are working with us to-day. Everyone will be prepared to admit that the first duty of a gas manager is to supply good, pure gas. In attempting to achieve this end, he has, for the welfare of his company and the satisfaction of the consumer, to consider how it may be effected with the greatest economy and efficiency. There may be a large or a small percentage of impurities in the gas, the absorption of which in the scrubbers, washers, or purifiers, is essential, in order to get the largest amount of luminosity, and to render the gas quite suitable for domestic use in every form.

The late Mr. Lewis Thompson maintained that common lime was the only suitable material that could be used for purifying coal gas without at the same time reducing its illuminating power; "and that common lime used in a dry lime purifier is the most effective, economical, and least hurtful agent to which impure gas can be subjected no practical man can venture to deny." The late Mr. John Somerville gave it as his opinion that the best system of purification was by using clean lime, oxide of iron, sulphide of calcium, and lastly oxide again; and by that means the bisulphide of carbon could be kept down to within 15 grains per 100 cubic feet at a cost of 6d. per ton of coal carbonized. He strongly recommended large area and plenty of time contact. The late Mr. R. H. Patterson, one of the Metropolitan Gas Referees, strongly condemned the idea that ordinary foul lime absorbed the sulphur in other forms than sulphuretted hydrogen; and he said that to employ lime to purify gas indiscriminately from carbonic acid, sulphuretted hydrogen, and sulphur in other forms, was a sheer waste of material. Mr. Stephen Carpenter, of the gas-works at Bow, has written a very valuable pamphlet giving instructions for purifying coal gas by means of common lime; and in works where a sufficient number of purifiers are in use, it would appear to be a very decided improvement upon many of the systems now adopted. He strongly advocates the use of lime for purification, and employs a very simple method for the revivification of foul lime. After fully explaining his system of working, he gives the following instructions: (1) Exclude atmospheric air from the lime purifiers. (2) Well wash or scrub the gas to thoroughly remove all traces of ammonia and as much carbonic acid as possible. (3) Pass the gas through a purifier charged with lime to free it from the remaining carbonic acid before it passes into the purifier containing sulphide of calcium. The writer claims that this is the best and most practical way of purifying gas from carbonic acid and the sulphur compounds other than sulphuretted hydrogen. The scrubbing of the gas is an important item; and if this is thoroughly done, and the gas at the inlet to the purifiers does not contain more than 1·4 per cent. of carbonic acid, 0·3 per cent. of sulphuretted hydrogen, and from 38 to 42 grains of bisulphide of carbon in 100 cubic feet, and no ammonia, good results will be obtained by the lime purifiers—the sulphur compounds other than sulphuretted hydrogen averaging about 12 grains in 100 cubic feet. This method of purification the writer has had in use for 27 years.

Mr. W. J. A. Butterfield, in his new work on "The Chemistry of Gas Manufacture," when speaking of purification, says:

Where the number of purifying vessels is very limited, and where objectionable odours on the opening of foul vessels must be as far as

possible avoided, another method of working is very commonly adopted. In this the use of separate sulphide vessels is abolished, and a partially sulphided lime vessel is practically the absorbent material for carbon disulphide. Air or oxygen is admitted to the gas in regulated proportion, either immediately before the first purifier, or at an earlier stage in the course of the gas from the retorts. . . . The oxygen, either pure or in air, effects an oxidation of the sulphur compounds of the lime, and sulphur is deposited as such in considerable quantities in the foul lime. The amount of oxygen admitted must not be sufficient to prevent the stability of a certain amount of sulphided lime in the last vessels, or no material will be present for the absorption of carbon disulphide. Consequently, oxygen or air must be used in amount insufficient for the oxidation of the whole of the sulphuretted hydrogen in the gas; that is, oxygen must not be present in the gas at the outlet of the last lime purifier. . . . That a small percentage of air admitted before the lime purifiers has not a deteriorating effect on the illuminating power of gas is conceivable, and is indeed proved by experience; but that the corresponding amount of oxygen would give a better result is granted by nearly all. Whether the slightly improved result is worth the cost of the pure oxygen is extremely doubtful.

Mr. J. Barton, of Peterborough, in his presidential address to the Eastern Counties Association in 1890 stated:

During the past few years, the system of air or oxygen purification has been brought very prominently before us by gas engineers from different parts of the country, all of whom speak very highly of it, get satisfactory results, increase their yield of gas per ton of coal carbonized, reduce the cost of labour, and purify the gas to a state of purity never before realized. . . . The gas at these works was purified on this system with only a change of purifiers when the oxide was fully charged with sulphur, and the illuminating power maintained to a standard of over 18 candles from ordinary Lancashire coal. I am, therefore, quite convinced that this is one great step forward in achieving continuous purification in closed vessels. The main object of this process is to effect a continuous revivification of the oxide *in situ*. . . . I have known instances at the works already referred to where the purifiers have been charged with fresh oxide, and not again discharged until the material contained nearly 60 per cent. of sulphur.

The purification of gas is a subject upon which more has been said and written than perhaps any other branch of our industry; and as the foregoing extracts show, many men, with varying minds, have been working in different directions to accomplish the same object. To remove at one operation the impurities that are injurious to health and deleterious to the illuminating power of gas would be a great boon to both makers and consumers. We have heard that Weldon Mud will remove carbonic acid, sulphuretted hydrogen, and bisulphide of carbon at one operation; and if that be so, we ought to adopt it, and find for it a much prettier and more expressive name than the ugly monosyllable "mud."

Of course, there are many local circumstances to be taken into consideration when deciding on the system to be adopted in the purification of gas. In my own case, I am arranging to work with clean lime, oxide of iron, sulphide of calcium, and oxide of iron, and introduce air at the foul main; feeling certain that the arresting of the sulphur compounds is most surely and economically accomplished by having (1) lime for carbonic acid, (2) oxide of iron for sulphuretted hydrogen, (3) sulphide of calcium for bisulphide of carbon, and (4) oxide of iron as a catch to arrest any remaining trace of sulphuretted hydrogen. If I used lime alone, it would either necessitate some means being used for the revivifying of the foul lime, or paying a very excessive charge for carting it away, because there is no demand for it in my locality, and what little is made is only disposed of by asking the farmers, as a kind of favour, to remove it free of charge. In some localities, offensive odours from the gas-works are strictly prohibited, which makes the process of purification to be generally an expensive one. But whatever may be the conditions, it is our duty to work with as little offence as possible to the neighbourhood; for, under ordinary conditions, the gas-works need not, and ought not to be looked upon as an intolerable nuisance.

Those of us who accepted our ex-President's kind invitation to Coventry last summer, and saw the modern and complete system of purification adopted by him, were much pleased with it; and, coupled with the excellent address he gave us upon the subject, it proved to be a source of very valuable information to many of us.

The quantity and nature of the impurities which have to be removed at the purification stage are principally dependent upon the constitution of the coal carbonized for the production of the gas. In it are the hydrocarbons, oxygen, nitrogen, and sulphur; all of which lead, by combination, to the formation of impurities which have to be removed from the gas before it is fit for consumption—the sulphur being undoubtedly the most troublesome of them all. The increased knowledge of the chemistry of purification now possessed enables the sulphur question to be dealt with more easily, and at less expense than formerly, providing that the purifiers are sufficient in number and capacity.

My purpose in dwelling for so long a time upon the process of purification is to impress upon some of my brethren that the purification of coal gas is something more than pitching so much foul lime out of a purifier-box, and replacing it with a corresponding quantity of clean lime, and afterwards merely testing for sulphuretted hydrogen. The purification of coal gas is a beautiful process of chemical action and reaction; and the more we study and understand it, the easier will it be for us to supply good pure gas to the consumers of our districts. Whatever process we adopt, it must consist in turning to practical account in various forms one single principle—viz., that of affinity.

Carburetted water gas is very popular with us just now; and we expect great things from it. Those of us who were favoured by receiving an invitation from Mr. William King, of Liverpool, and permitted to inspect that splendid display of apparatus and buildings at Wavertree station, were fully justified in our expectations; and among the reserve sources of supply, we may look to water gas to stand with us in time of need, for those of our profession who have adopted it speak of it in the highest terms of praise. Our friend in the sister isle, Mr. James Stelfox, of Belfast, when reading a paper upon this subject before the Incorporated Gas Institute, gave a very interesting and graphic description of his first experience with the new assistant. Again, Mr. S. R. Ogden, of Blackburn, in a paper read before the Manchester District Institution of Gas Engineers, stated that "the question of carburetted water gas is one that demands attention from all gas engineers as a ready means of fighting our various opponents."

The days ought to be past when large quantities of smoke, sulphur, and soot are the necessary accompaniments of the manufacture of coal gas. We may, one and all, hope to see the time when the smallest of our gas-works will be able to have a carburetted water-gas plant to assist in supplying gas during the dark days of winter, and enable us to work with less nuisance, capital, anxiety, and worry.

It is not necessary for me to excuse myself when reminding you that the electric light continues with us; but we do not now fear when we read the latest prospectus, or learn of successful installations in various parts of our land, neither does the Press taunt us so frequently by reminding us that our occupation is gone. Still, we must be careful and watchful, so that whatever invention or improvement may come to the front, it may not find us sleeping, but waiting to give it a fair and honest trial. The electric light has not greatly interfered with the advance and further development of the gas industry, for the last return received from gas undertakings, and published by the Board of Trade, clearly shows that the manufacture of coal gas continues to make steady progress. Therefore we need not oppose electricity, but rather leave it to go on quietly, for it must submit to the commercial test. Electricity will, without doubt, be used in certain spheres; and wherever that sphere is found to be, therein will it live out its day, and gas must await the result. In the meantime, we may pursue that undeviating line of conduct laid down for us by our leaders. Up to the present time, no large town has appeared to suffer much from the companionship of the electric light; and while such places as Leicester, Blackpool, and Bolton have gas and electric light working together under one management, and can speak well of the progress of both, we may rest assured that it will be a long time before we are called upon to behold the ruin of the gas company in our own towns and districts. The "JOURNAL OF GAS LIGHTING" a few weeks ago stated "that genuine speculation in electric lighting during last year did not exist to any large amount, and investors were left to struggle as best they could with the troublesome 'load' factor."

In 1863, the British Association of Gas Managers was established, and commenced work under the care and guidance of a noble-hearted body of gentlemen most of whom have now passed from us. We all fully appreciate their kind work, and acknowledge the great good which the Association did in its day by breaking down so many of the barriers to social intercourse, and striving to make the many members of the great industry as one body; feeling it was not good for any gas manager to live to himself, but that the wisest of them might learn much by associating with their brethren, and appreciating the truth of the words of the poet when he said: "Knowledge grows, but wisdom lingers." In reviewing the work and history of our own Association, it is very gratifying to note the progress which we have made, and the useful work that has been accomplished; and how it has assisted in bringing together, at short intervals, members of the same profession who have not many opportunities for social intercourse and the interchange of ideas connected with the every-day duties and difficulties of their lives. As one of the older members of the Association, I wish to express the deep debt of gratitude which we are under to the "JOURNAL OF GAS LIGHTING" for the free and generous manner in which it has always been ready to publish our proceedings, and thereby added greatly to their value; and to-day we have with us, for the first time, a representative of the other portion of our Press, the "Gas World," which, I am sure, will always endeavour to exercise the same spirit of generosity and friendship towards us. We, as an Association, are an immense power for good in our profession; and I cannot but think that every board of directors or committee must appreciate the wisdom of their manager when he enrols his name in one or other of the many valuable Associations whose object is to investigate and discuss every new thing bearing upon gas manufacture and distribution. There are many managers of gas-works in the Midlands who are indifferent, or from some other cause fail to come amongst us; and occasionally we hear the statement that the managers of small gas-works need not trouble about District Associations and their advantages. There could not be a greater mistake. The importance of manufacturing the gas and lighting any town

therewith, however small it may be, demands that it be done in the best manner possible.

It is essential that we do all we can to encourage members to lay their views before us upon any subject on which they have bestowed special attention, by meeting them with frank yet kindly discussion, and so seek for improvement in the knowledge and practice of our profession by the mutual interchange of experience—ever remembering that we cannot give without receiving much more in return. I fear that we often underestimate the great benefit which accrues from the free exchange of views upon various matters connected with the manufacture of coal gas which takes place in a friendly way on the occasion of these district gatherings. Personally, I am ready and pleased to admit that they have afforded me much assistance, which has enabled me to overcome many a difficulty.

Technical education has not been without its influenceupon the younger gas managers of to-day, and will doubtless exercise a more potent influence in the future. All our powers need to be concentrated upon our work, as many of us are called upon to unite in ourselves th e various duties of engineer, chemist, secretary, and accountant, as well as to take the general supervision of the workmen; for it must be borne in mind that by far the larger proportion of the gas-works are too small to permit of the duties being divided. Then the unique position which the gas-works manager fills isolates him very much from his fellows, and casts him upon his own resources.

There are many other popular matters connected with our profession; but time bids me close my address. In conclusion, I have to confess it has been difficult to gather together suitable matter to make my address as original, interesting, and instructive as I could wish it to be, and as you had a right to expect; and it is my duty to thank you for having so patiently listened to my remarks, interspersed as they are with the words of gentlemen in our profession, and which illustrate my various points better than any of mine could have done. Horace of old said: "It is very difficult to talk to people about that which they know." I have found his words to be true, for the pebbles I have been able to gather along the sea shore of our great industry and submit to you have been very few and poor; and I feel that it is your kindness rather than my ability that has placed me in the honourable position of being your President to-day.

Mr. CHARLES HUNT proposed that a cordial vote of thanks should be given to the President for his very admirable and suggestive address. It was only the "irony of fate" which compelled their President to read his address under an opposition light. (Laughter.) Electricity, he thought, was certain to stimulate their profession; and he considered they were none the worse for its advent. He had great pleasure in proposing that their cordial thanks be given to Mr. Cooper for his address.

Mr. R. O. PATERSON (Cheltenham) seconded the resolution; and, in doing so, he confessed he was not in the slightest disappointed with the address because their President began with an apology. He (the speaker) had generally found that a man who began with an apology had something very useful to follow. He felt sure no one could have listened to the able address of their President without feeling that he had given a great amount of thought and time to the subjects with which he had dealt so lucidly; and rather than say he had nothing new to lay before the Association, he thought he might have left that out, for they would agree with him that Mr. Cooper had a great deal of both useful and important information to submit to them. He had discharged his duty on that occasion with a great deal of benefit to them all.

The resolution was put and carried with acclamation.

The PRESIDENT, in acknowledging the vote, said he introduced his address to the members with great misgivings, knowing so well that there were many gentlemen connected with the Association who were much more conversant with the routine of gas-works than he was. He had, therefore, a certain amount of diffidence in coming before the members. However, as they were so kind as to honour him with election as President, he felt it to be his duty to do the best he could.

The members then proceeded to Messrs. Elkington and Co.'s works in Newhall Street, and, upon returning to the Hotel, a meat-tea was provided.

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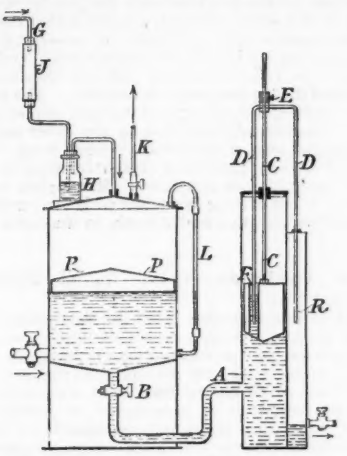
**The Dangers of Acetylene Gas.**—In another part of the "JOURNAL," we give the result of the Coroner's investigation into the circumstances attending the loss of life through the explosion of acetylene gas at New Haven (Conn.) on the 21st ult., as recorded in our columns a fortnight ago. The matter has caused some alarm; for we learn that a Bill has been introduced into the Massachusetts Legislature to empower the Board of Gas and Electric Light Commissioners to inquire generally into the subject of this gas.

**The Local Indebtedness of England and Wales** is increasing very rapidly. In 1875 it was nearly £93,000,000, or about one-eighth of the National Debt, which was then £769,000,000. By 1893 (the latest year for which statistics are given), it had risen to £215,250,000, or nearly one-third of the National Debt, which had been reduced to £671,000,000. It must be remembered, however, that a large proportion of the local debt is represented by undertakings such as gas-works, water-works, markets, harbours, and docks, which are directly remunerative.

# REGISTER OF PATENTS.

**Collecting and Analyzing Gases.**—Waller, F. G., of Delf, Holland No. 1040; Jan. 16, 1895.

The patentee proposes to use two vessels united by a pipe A, provided with a cock B. One of the vessels is much larger than the other; and both are partly filled with any suitable fluid. The smaller vessel contains a float, to which is attached a vertically guided rod C; and to this rod a syphon-tube D is secured, so that it can be lowered or




raised and afterwards fastened in any desired position. One end of the syphon dips into the fluid through a hole F in the float; and the other end R hangs free in a cistern, provided at its lower end with a cock. The larger vessel contains a floating body P, to separate nearly the whole surface of the fluid from the space above it. From the upper part of the vessel, a small pipe leads to the funnel smoke-box, or whatever space contains the gases or vapours to be collected and examined, and which is provided with a soot-filter J, a draining apparatus, and a non-return valve H. This non-return valve may be composed of a bottle with fluid, into which the inlet or supply pipe plunges, while the outlet or delivering pipe terminates above the surface of the fluid. The valve H prevents the gases flowing in the inverse direction—that is, from the vessel to the smoke-box or space containing the gases to be collected.

Before the apparatus is set to work, the two main vessels are filled by pouring the liquid into the smaller one, after having removed its cover. The air contained in the larger vessel will then flow off through the pipe K into the open air; and when the apparatus is thus filled with fluid, no air enters again into it. The larger vessel is only filled with gases or vapours by the lowering of the levels of the fluid in the two vessels caused by the working of the syphon D; and afterwards the gases or vapours are driven out by forcing the fluid under pressure through the inlet-cock.

The apparatus works in the following manner: The syphon D is so fixed on the rod C of the float that the velocity of discharge of the fluid has the desired value. Because the syphon descends with the float, the velocity of discharge remains constant if the level of the fluid falls down. Both vessels are now wholly filled with fluid. The cock B on the pipe A between the vessels is open, so that these vessels communicate with each other. The cock on the cistern is also open, so that the fluid drawn over through the syphon D may flow off from the cistern. The other cocks are closed. Now the gas or vapour to be gathered is let through from the funnel, smoke-box, or reservoir space containing the gases into the larger vessel. The level of the fluid in it descends with the level in the smaller vessel, where it flows off through the syphon. From this moment, a quantity of gas or vapour is gathered very regularly; and the larger vessel is slowly filled with it. After this, the inlet-cock is opened, so that fluid under pressure is admitted and the gases pressed away through the pipe K to the apparatus for making the analyses. The fluid injected through the inlet-cock would preferably be that which flows through the outlet-cock from the cistern to any suitable accumulator. The valve H prevents the gases being drawn back through the inlet-pipe to the smoke-box, funnel, or reservoir.

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**Manufacture of Carbides or Acetylides of the Earth Metals and Alkali-Earth Metals, and of the Oxides or Salts of these Metals.**—Bullier, L. M., of Paris. No. 2820; Feb. 8, 1895.

This invention relates to the direct manufacture, on a commercial scale, of the carbides of the earth-metals and alkali-earth metals, and of the oxides of these metals. The process consists essentially in heating in an electric furnace—such as a Moissan furnace—a mixture of carbon with the oxide of the earth-metal or alkali-earth metal to be carburized. The product obtained in the furnace is fluid at the temperature at which it is produced, and forms on cooling a crystalline mass of a dark colour, which is the carbide of the metal corresponding to the oxide treated. It is thus possible (says the patentee) to obtain with great facility the carbides of calcium, barium, or strontium, as well as the carbides and acetylides of rare earth-metals—such as cerium, thorium, lanthanium, &c. By employing, for example, 56 parts by weight of quicklime and 36 parts of sugar-charcoal, wood-charcoal, lampblack, or other variety of carbon, a definite carbide is obtained corresponding to the formula $C_2Ca$; and, by adding an excess of lime, carbides of variable composition may be obtained.

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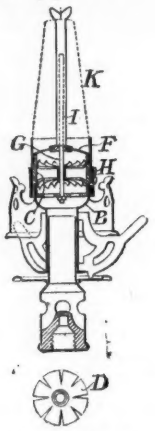
**Explosion Engines.**—Stanley, R., of Nuneaton. No. 3357; Feb. 15, 1895.

This invention relates to that class of engines having a vibratory piston or pistons, and in which the cycle of operations is arranged to work on the "Otto" principle. The improvements consist chiefly in

providing segmental chambers in which circular pistons may work, instead of rectangular pistons as heretofore; the connecting-rods being attached directly to the extremities of the arms carrying the piston-rods, without the intervention of a crank. The patentee provides a series of chambers—preferably four—each forming longitudinally the segment of a circle, and having four pistons, one in each chamber, capable of working therein, and connected by arms or the like with a central boss, from which the centre pistons perform their strokes. The chambers are formed by making a pair of hollow castings, segmental in shape, and divided in the middle of their lengths by a partition. These are further provided with flanges, for securely bolting to the bedplate of the engine, in such a position that they are symmetrically opposite to one another; sufficient space—equal to the length of one chamber—being left between the ends for the stroke of the pistons or piston-rods. In order to ensure stability, they may be connected by a web formed during the process of casting. The pistons or piston-rods are also segmental in form; and one pair of pistons is attached to a radial arm diametrically opposite to the other pair, which is also fixed upon a radial arm rigid with the central boss. The connecting-rod is attached to one piston-rod or double piston at a point midway between the extremities of the latter. It is forked through a portion of its length, to avoid coming in contact with the segmental chamber—being attached at its other end directly to the crank driving the fly-wheel.

**Incandescent Gas-Lights.**—Violet, R., of Berlin. No. 5213; March 12, 1895.

The object of this invention is, in the first place, to create, in an incandescent burner, as high a degree of heat as may be practically attained, by operating a "perfect and most intimate mixture of the rising current of atmospheric air with the gas to be consumed, whereby complete combustion of all combustible matter contained in the gas is obtained." Further, it is of importance to accelerate the upward movement of the mixture of gas and atmospheric air within the burner tube, "whereby the flame will burn with a higher pressure than actually exists in the gas feed-pipes."




On a bunsen burner of the usual and well-known construction, a tube B is mounted, so as equally to serve to support a lamp-chimney fitting into a gallery carried by the tube. Within the enlarged upper end of the tube, a box or casing C is screwed. The bottom of C is perforated, and its top is covered by a sieve F. In the centre of the casing is a pin or rod, to the lower portion of which (and inside the casing C) fan-wheels D are mounted and adjusted in their proper position to each other.

The effect of the burner is as follows: The gas issuing from the inlet-nozzle carries along by suction the atmospheric air entering through the apertures in it; and in passing upwards, the mixture of gas and air encounters the fan-wheel, whereby the mixture is forced to assume a rotary motion, which serves to effect intimate mixture of the gas and air. If another fan-wheel is applied, the mixture in its upward flow must pass the other fan-wheel too, the wings of which have a position opposite to those of the lower wheel. The rising current is thereby forced to take a direction opposite to that followed before; and owing to this reversed rotary motion of the rising current, the mixture of gas and air is made as intimate as possible. When the flame has been ignited, the amount of gas and air consumed, and the increasing heat, act to accelerate the rising current; and the fan-wheels begin to effect a suction, by means of which the upward speed of the current of gas and air is further increased, and the pressure in the flame raised to a higher degree.

The incandescent body K is hung to the tube I, forked at its upper end; the extensions of the forked portion serving as a means by which the tube may be held when mounting it. The pin G is slotted, to permit the tube I to be adjusted by friction against the surface in any desired position, in order to properly adjust the incandescent body K, as desired. To prevent the incandescent body from being displaced in a lateral direction, it is secured, by means of a ring H, to the tube B. The ring may be open and hinged to a lug of the tube, and be locked against accidental opening by a suitable clasp.

**Regenerative Argand Gas-Burner.**—Rowan, T., of Hackney. No. 6027; March 22, 1895.

This invention—relating to "the more economical use of gas for lighting purposes"—consists in "an improved method for the breaking up or attenuation of gas-jets, so as to render them more highly incandescent, with a minimum employment of gas, subjected at the point of ignition to the action of an exactly proportioned and controlled current or currents of highly heated air, and in means for effecting the said purpose, whereby a vivid light of great intensity is produced at a small relative consumption of gas." The invention is an improvement on that described in patent No. 1067 of 1895.

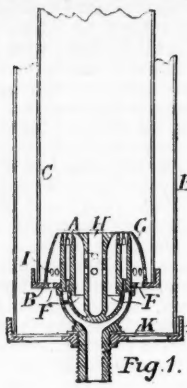


Fig. 1.

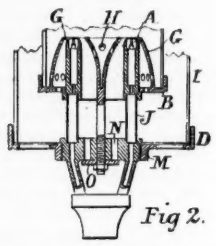


Fig 2.

To carry his invention into effect, the patentee arranges upon the burner A a gallery B, carrying an inner chimney C, and a second gallery D, carrying an outer chimney E. Thus between the two chimneys an annular space exists, which communicates at its upper end with the external atmosphere, and at its lower end with the air-passages F, leading to the spaces around and within the burner. The bottom of the gallery D is closed by a mica diaphragm K. In order to break up or attenuate the flame, the orifices for the gas in the burner-ring are arranged at a greater distance from one another than in ordinary argand burners. An ordinary argand giving a lighting efficiency of about 2 or 3 candle power per cubic foot of gas burnt per hour, would have a ring 1 inch diameter with 36 orifices; and with a single chimney (when burning 5 cubic feet per hour of 16-candle gas), a light of about 12 candles is obtained. When burning 5 cubic feet of similar gas per hour in one of these 1-inch ring burners with 12 gas-orifices of the same diameter as the ordinary burner, but with the double chimney, it is claimed that a lighting effect of 35 candles is obtained.

The attenuation of the flame is produced by adjusting the draught in the syphon chimneys and the high temperature of the air supplied, so that the flame, broken up by the burner, gives extended surface with small thickness or volume of jet. A cone G is arranged of such shape as to cause the current of heated air to intermix with the issuing gas. There is also a central tube spreader H, having a similar object with regard to the inside surface of the flame. In this way, there is fed directly to the flame an amount of heated air in such a way as to produce "a very high incandescent effect upon the carbon particles of the flame. Too little air would produce a smoky flame, and too much air would cause the carbon to be consumed too readily to allow of it being in an incandescent state sufficiently long to produce a flame of high luminosity." The highest luminous efficiency is said to be obtained when the inner chimney is 2 inches outside diameter and 9 inches long, and the outer chimney is 2½ inches inside diameter and 6 inches long. The top of the outer chimney is arranged 4 inches below that of the inner chimney. The area of the air-channels through the centre of the burner, through the holes I, and up the cone G for the supply of air to the flame, is 1·166 square inches. The arrangements of the pipes or channels J, by which the gas is led up to the burner within the hot-air space, is such that the gas, travelling therethrough at a considerable velocity, does not become very highly heated; further the temperature of the burner is kept low by the transmission of heat from the burner by conduction down the pipes into the fitting that supports the burner, and is dissipated by radiation to the surrounding atmosphere.

In fig. 2 a modification in the construction of the burner is shown, whereby the lighting efficiency is said to be further increased. This consists in the provision of means whereby a current of cold air is led up around the gas-supply channels so as to extract the heat therefrom, and then passes on to mix with the gas to support combustion. In this way, the flame is protected from loss of heat by outward radiation by the envelopes of heated air in the chimneys; but the carbon particles of the flame are kept at a sufficiently low temperature to give high incandescence, and at the same time the too ready combustion of the carbon is prevented, thus giving the flame intensity. The central spreader H is mounted on a supporting boss M, and air-orifices N are arranged through the boss, so that the cold air passes to the central air-passage, from which it issues and mixes with the flame. An adjustable shutter O may be fitted to these orifices—such as a disc having apertures therethrough, adapted to revolve and eclipse more or less the holes in the boss, in order to regulate the amount of cold air admitted to the burner. The central air-inlet is formed by an open-ended central tube, which feeds air, heated by contact with the metal of the central air-way, to the interior of the flame, having the same effect in producing a flame of high incandescence as the means already described.

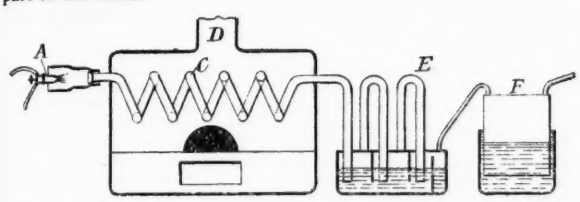
**Treatment of Coal-Dust to Adapt it for Use as Fuel and for the Manufacture of Gas**—M'Dougall, A., of Southport. No. 6300; March 27, 1895.

The specification of this patent is as follows: "My invention has for its object the improvement of coal for heating and the production of improved illuminating gas. To effect these purposes, I use coal-dust, or I reduce coal to powder, and then mix it with oil obtained from tar, paraffin, or petroleum, by which its heating and gas-yielding properties are improved. I have found that the addition of 10 per cent. of the oil to the powdered coal gives a satisfactory result when used for heating, or when charged into gas-retorts with scoop or shovel. A larger proportion than 10 per cent. may be used with the finely-divided coal for any of the purposes to which the mixture may be applied. As the

quality of the oil varies, the proportion used with the coal varies also; but the general average is about 10 per cent. The purposes for which the oiled coal is adapted are the manufacture of gas, the raising of steam, the reduction of metallic ores, and the general production of heat for domestic or manufacturing purposes. Coal-dust which may have been damped is carefully dried before being charged with the oil."

**Gasifying and Distilling Hydrocarbon Liquids.**—Pitt, S.; a communication from La Société Internationale des Procédés Adolphe Seigle, of Levallois-Perret, France. No. 19,036; Oct. 10, 1895.

This invention relates to "a new process for treating hydrocarbon liquids mixed or emulsified with water by means of a heating apparatus of any convenient form, for the production of gas or lighter hydrocarbons than the hydrocarbons treated." This result is obtained by means of the apparatus shown, consisting essentially of a spray-producer or other mixer producing an emulsion of water and hydrocarbon, which emulsion is led through a heated metallic worm, in which is effected successively the reduction of the vapour of water by the carbon resulting from the dissolution of certain elements of the heavy oil, and the carburation of the poor gas thus obtained by the hydrocarbon vapour. The proportion of the poor gas can be augmented (if necessary) by the introduction of carbon or coke into part of the worm.




A is a spray-producer for the heavy coal, petroleum, schist, resin, or like oil operated by vapour of water under pressure. This vapour is admitted to the spray-producer by the lower flexible pipe shown. The upper pipe supplies the heavy oil. C is the heated metallic worm, in which circulates the jet of vapour of water and of heavy oil, pulverized in such manner that "the two bodies are intimately mixed and incorporated the one with the other, as it were molecule to molecule." Under the influence of the high temperature, the oil is partially dissociated, with the formation of stable hydrocarbons and free carbon. The vapour re-acts on the incandescent free carbon, forming a mixture of hydrogen, carbonic oxide, and carbonic acid (in proportions varying according to the temperature), and constituting a poor gas. This poor gas, enriched by mixing with the hydrocarbon vapours, then leaves the worm, and enters the condenser-purifier E. D is a furnace in which the worm C is kept at the desired temperature; E is a condenser-purifier, containing thin milk of lime, in which the heated products are deprived of their condensable constituents and carbonic acid; and F is a gasholder.

**Charging Inclined Retorts.**—Herring, W. R., of Huddersfield, and Graham, Maurice, of Lime Street Square, London. No. 23,989; Dec. 14, 1895.

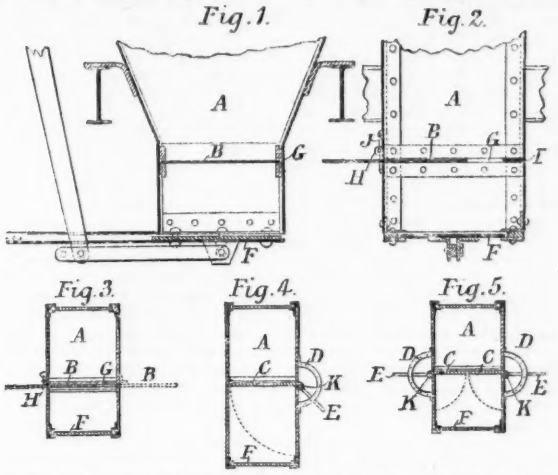
This invention has for its object "the method of regulating the velocity and manner of delivery of coal or other material from overhead measuring chambers into charging-shoots, which conduct the coal into retorts or ovens where an even distribution or layer of the material is required."

Referring to their proposal, the patentees say: It has hitherto been the custom, when using measuring chambers for measuring charges of coal, to adopt the powder-flask arrangement, whereby there is introduced a top and bottom sliding shutter or valve, and which are connected by one lever working on a centre pivot. When the top door is open, the bottom one is shut; and consequently the desired quantity, or a full chamber measure, is obtained. It has been found, however, that, when the bottom lever attains a full stroke (so as to shut the top door completely), there has been no regulation of the area of the opening for the different varieties of coal, and for the different distances between the tiers of retorts or ovens; and consequently the discharging aperture remains of the same area when the main is at full stroke for a long or short drop, and also for the different varieties of coal. Hitherto, this has been attempted, in some cases by means of fixed shields, and in others by regulating the aperture of the discharging end of the chamber by means of its sliding valve or shutter. But this also permits of an additional quantity of coal falling into the chamber from the hopper, or in other terms permitting the coal to bye-pass off, through the upper valve being only partially shut (the two valves being attached to one lever on the "shot-pouch" principle so that one is not closed until the other is open), and consequently preventing the accurate regulation of the weight or capacity of the charge which the chamber is particularly introduced to regulate. In some cases, to overcome this difficulty of delivery, the measuring chamber, instead of being on the "shot-pouch" principle, having its valves coupled, each valve has been fitted with separate levers for independent action; so that when the top door is shut, the bottom door can be partially opened or closed to reduce or increase the area. But as this is an indefinite regulation, and absolutely depends upon the skill and judgment of the operator, and is variable at each charge, it can readily be seen that, to insure more regular charging with unskilled operators, a more definite means of regulation is a necessity.

This is sought to be attained by the mechanism illustrated.

Fig. 1 is a vertical section of the base of a measuring chamber and the sliding-plate; and fig. 2 is a transverse section. Fig. 3 is a vertical section of a measuring chamber with a double slide or doors; fig. 4, one with a flap and quadrant; and fig. 5, one with two flaps and levers and quadrants.

Above the lower door F is a regulating slide-plate B, as in figs. 1 and 2, or double slide-plates B, as in fig. 3, to adjust the aperture of the opening according to the quantity and quality of coal. It is customary for measuring chambers to have a flap inside, whereby the weights they contain can be adjusted to the extent of 25 to 30 per cent. It is therefore in these cases of double importance that means of regulating the area of the aperture through which the given quantities of coal passes in its descent from the chamber without interfering with its capacity should be made easy of regulation. The accomplishment of this object is attained by using one or more sliding-plates B, shutter-flaps C, or doors placed immediately above the lower discharging valve or door F, which are made to work in grooves G, and to slide (preferably, but not of necessity) in a direction at right angles to the travel of the main valves to the measuring chamber A. The same object can also be accomplished by a swinging flap C or door, as in fig. 4, or flaps C or doors, as in fig. 5; both arrangements being provided with suitable external adjustments, which can be secured by locks and keys, so that interference on the part of unauthorized persons is prevented.







In fig. 2 there is a pin H in order to set the sliding-plate B, for fixing the size of the opening between it and a stop-piece I fixed to the opposite side of the measuring chamber.

In fig. 3, the measuring chamber has two sliding-plates B, operating in a groove G. These doors or sliding-plates may be adjusted by a set-pin H or pins attached to the apparatus by chains J.

In fig. 4, the measuring chamber has a single flap C, working on centres or pins K, and operated by a lever E sliding in a quadrant D.

In fig. 5, the measuring chamber is constructed with two flaps C, working on centres or pins K, and operated by levers E sliding in perforated quadrants D. The levers are fixed by set-pins passing through a hole in the quadrant and lever.

## APPLICATIONS FOR LETTERS PATENT.

3004.—Le Roy, W. H., "Preventing the bursting of water-pipes by freezing." Feb. 10.

3014.—Shoosmith, W., "Joints or unions for pipes and the like." Feb. 10.

3101.—Frase, P., "Devices for heating and lighting apartments." Feb. 11.

3142.—Thorn, F. S., and Hoddle, C., "Acetylene gas generator and container." Feb. 12.

3179.—Heggie, J., and Buckley, M., "Lamps, gas-lights, stoves, and hot-air radiators." Feb. 12.

3217.—Abel, C. D., "Upright gas and oil motor engines." A communication from the Gasmotoren Fabrik Deutz. Feb. 12.

3219.—Pym, E. B., and Gore, J., "Manufacture of acetylene gas." Feb. 12.

3262.—Burkert, H., "Glowing nets for gaslight." Feb. 13.

3278.—Wolfcarius, E., "Bell-shaped glass or globe for gas-lamps with inverted flame." Feb. 13.

3300.—Shaw, E. J., "Bowls or shades for use with incandescent gas or other burners." Feb. 13.

3316.—Canellopoulos, J. M., "Gas-igniting arrangements of incandescence gas-lamps." Feb. 13.

3319.—Canellopoulos, J. M., and Kratz-Boussac, H. O., "Igniting gas in incandescence gas-lamps." Feb. 13.

3338.—Exley, J. H., "Manufacture of acetylene gas." Feb. 14.

3422.—Amick, M. J., "Gas-regulator." Feb. 14.

3461.—Isaac, G., "New process for the production of an indestructible incandescent substance for use with illuminating gases." Feb. 15.

3464.—Hall, J. C., Dance, H. C. A., and Hall, A. R., "Automatic acetylene gas generator." Feb. 15.

3503.—Shuttleworth, A. & F., and Deed, P., "Igniting arrangements of gas and hydrocarbon engines." Feb. 15.

**The Leeds Corporation Gas Committee and the Demands of their Workmen.**—The Gas Committee of the Leeds Corporation have given careful consideration to the demands of the gas workers of the city for more wages and improved working conditions; and they have decided to recommend the Council as follows: That no change be made in the wages or hours of labour of the stokers, firemen, or coal-wheelers; that purifier and engine men be placed on the eight-hour day, with no advance of wages; that no change be made in the wages or hours of labour of the yard men; that the cinder-throwers be placed on the eight-hour day, with no advance of wages, conditionally on the same amount of work being done as at present; that employment of boiler-men be discontinued, and that they be engaged as engine men or in any other suitable capacity; and that the engine men be paid for Sunday work at the present rate of wages.

## CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

### The Gaslight and Coke Company and the South Metropolitan Gas Company and their Coke.

SIR,—I have no desire to hurt Mr. Bevan in any way. He says, in his letter which appeared in last Tuesday's "JOURNAL," I have done him an injustice in saying that it afterwards appeared that, in raising the price of coke to 12s. 6d. in our case, and to 13s. 6d. under pressure elsewhere, it was done to injure other makers. In his letter he gives the reason for his action, which I, of course, accept; and I regret having attributed to him a wrong motive. Let me say, however, that the idea did not originate with me, but with other cement makers—both the weak and the strong financially—who could not account for his action in any other way. In one sense, I am glad I made the statement, because it has led to the correction of the misunderstanding of his motive, which puts a new light upon the position of the cement makers and their relation to the Gas Companies.

The publication of some correspondence of Mr. Bevan between himself and my brother requires notice. We have only a limited quantity of coke to sell to the cement makers—the surplus, in fact—because we prefer selling as much as possible locally and to dealers at a rather better price. We have among the cement makers certain regular contractors whose practice it is to apply to us in July or August every year to renew their contracts, which run from October to the following September inclusive. Mr. Bevan's firm had not for many years taken coke from us until they made an odd purchase of 1000 tons in March, 1893. The correspondence shows that Mr. Bevan wished to make a contract for 1893-4; but evidently he and my brother misunderstood each other. My brother expected Mr. Bevan to come at the usual contracting time, and assumed that, as he did not come, he did not want coke. Mr. Bevan, on the other hand, not knowing our practice, waited to hear from us, with the regretted result that, when he did apply, our regular customers had contracted for all we had to sell.

This goes far to explain the action of Mr. Bevan, which was so puzzling in the following year. He came very early in order to secure coke; and, further, in order to make sure of getting it, he came prepared to offer a high price. On the facts of that interview, our recollections differ. I am quite sure, and so is my brother, that no intermediate price was offered, but that Mr. Bevan's first offer was 12s. 6d. per ton. It was this that so astonished us, when the price, under the contracts of the current year, was only 10s. 10d. per ton, or 6¼d. per cwt. Our coke is sold by the hundredweight; and when Mr. Bevan said, "The larger the quantity you will let me have, the higher price will I give," we were still more puzzled. We did not ask for any advance; but it is quite true that I hesitated—"hummed," as Mr. Bevan says. But it was not, as he supposed, because I wanted more, but, strange as it may seem, because I did not like to accept so high a price. I knew the condition of the coke market relatively to coal, and fully expected, if not a fall in price, certainly no increase. I also felt that, under these circumstances, to put up the price of coke would be, as the result undoubtedly has proved, a mistake; and this was the reason for my hesitation.

The only explanation I can imagine which can account for the difference between Mr. Bevan and myself is that, on his way, he was revolving in his own mind what offer he would make; that he first thought of 11s. 6d., and then 11s. 9d.; and, as he says he knew what he was going to do, he made a plunge. He felt he must have a contract, and resolved to make the extreme offer of 12s. 6d. I daresay that Mr. Bevan is as confident as to his recollection as we are; but had he raised his figure from 11s. 6d. to 12s. 6d. under pressure from us, I could have had no justification for what I have said on the point; and I say now what I felt all through—that I would rather have accepted an offer of 11s. 6d. at that time than 12s. 6d., because I foresaw that such a high price was certain to cause disaster to the coke trade. When, immediately afterwards, under pressure from the "Department of State," he advanced from 12s. 6d. to 13s. 6d., and the other cement makers were compelled to give 13s. 6d. to the Chartered Company, we weakly followed suit, and fixed our price at 13s. 4d., simply because we did not like the idea of our coke receipts being less than those on the other side. I never liked the price, and said I was sorry it had ever been made; while three months after making the contracts, we—the Board of Directors—voluntarily, without any suggestion from anyone, reduced all our 13s. 4d. contracts to Mr. Bevan's figure of 12s. 6d., which I thought at the time was an inadequate reduction.

Mr. Bevan describes this as "cheap philanthropy." It was nothing of the kind. The word "philanthropy" has no place in business; and I contend that our action was simply a common-sense business transaction. The price was an unfair one. The price of cement was very low; and the high price of coke led the cement makers to use small anthracite, which they could get delivered at a much lower rate per ton. They found that, with care, they could use one-third of anthracite—thus to this extent displacing coke; and, tempted by a good price, the provincial gas-works were likely to get a good proportion of the custom of the cement makers. Under these circumstances, I claim that it was good business to make the reduction; and if the "Department of State" had followed the example, they would have sold their coke at 10s., possibly 10s. 6d., a ton, instead of having nearly 200,000 tons in stock—the greater part lying on the Essex Marshes—on which the cost of carrying to and fro, the waste, and depreciation will entail a loss of quite 2s. a ton to come off the price they can obtain for it.

I think [the position of the cement makers is an arduous and an anxious one. Their very existence is seriously threatened by bounty-fed foreign competition; and for patriotic Englishmen to help the foreigner by selling him coke at a lower price than to their own countrymen and neighbours, is nothing short of an outrage. Whatever its sins, the South Metropolitan Company has never done this. The price of cement has consequently ruled very low for some years; and the present revival of trade, although increasing the demand for cement, has, so far, not increased the price. In addition to this very serious difficulty, they have the constant anxiety about their supplies of fuel, as fuel accounts for one-third of the cost of making cement. This anxiety is of two kinds—the price to be paid, and the uncertainty as to the quantity obtainable. Mr. Bevan tells us this latter point is so serious that it led him to offer the high price in 1894; and by that desperate move he has succeeded in obtaining such a large stock that all present anxiety on this score is removed.

Then as to the price. The cement makers have had their difficulties greatly increased by the uncertainty and the fluctuations of the price, which has borne no relation to the price of cement. The price of coal, strikes of the coal miners, and many other things, affect the price of coke. But, unfortunately for the cement makers, when coke is dear they cannot make a corresponding increase in the price of cement. It therefore seems reasonable that the London Gas Companies and the cement makers should adopt some mutual arrangement—fair to both sides, of course—that would tend to the encouragement of the cement trade on the Thames and Medway, and thus, while benefiting the trade, benefit also the Gas Companies, by regulating and increasing this branch of their trade, and keeping out provincial competition. This is an important point; for it appears that, whenever a provincial gas undertaking accumulates a stock of coke, they, in order, in many cases, to keep up the local price, send it to London at a very low figure. Coke comes thus to London not merely by rail from inland towns, but by sea from coast towns—often as return cargoes, I am informed by Mr. Bevan, from such places as Bristol, Cardiff, Plymouth, &c.

The cement makers truly say that, before the amalgamations of the London Gas Companies, they were able to buy coke cheap—too cheap, I think; and that was one reason why, on our absorption of the Phœnix and the Surrey Companies in 1880, we gave special attention to the development of the local trade, following the policy of the old South Metropolitan Company. The effect of these amalgamations has been just the same as a combination among the Gas Companies, though there is no friendly co-operation between them. This practical monopoly, and concentration of the wholesale coke trade, it may be said, almost in the hands of two Companies (for the Commercial sell very little to the cement makers), fully justifies their action in at last combining to protect themselves, and to obtain relief from their difficulties in regard to their supplies and the price of coke. I learn from independent quarters that they are obtaining ample supplies of coke, which are coming to London from all parts, and supplementing what they get in London. This certainly is detrimental to the London Gas Companies. But what is to be done? I shall have wasted my time and your space, as well as the time of those of your readers who care to peruse this letter, if no suggestion is made for a new and improved method.

I think, if all parties are willing, a satisfactory system is possible and practicable. The two essential points are quantity and price. As to the former, there need be no difficulty whatever. The London Gas Companies (and there is no reason why such of the Suburban Companies as care to join should not be included) can estimate within narrow limits the quantities of coke they can spare for the cement makers for twelve months in advance; and the cement makers, on the other hand, can, I suppose, do the same as to their requirements. If the Gas Companies have more coke to sell than the cement trade wants, they would, under such an arrangement, know beforehand that a given quantity must be otherwise disposed of. They could probably do this locally; and in the *last resort* export it. Of course, on the other hand, the associated cement makers must agree that they will not obtain supplies elsewhere unless the London supply is insufficient. Some elasticity in this rule would probably be necessary, and might well be allowed, to some extent, to meet those cases where, for instance, the cement makers might be delivering a cargo or a barge-load of cement or lime, and find it mutually advantageous to take a return load of coke. This, however, need not affect the principle of the arrangement. The Gas Companies would secure an outlet for their coke; and the cement makers would be relieved of their difficulty and anxiety in regard to their annual requirements. They would divide the total among themselves as they pleased, of course, in agreement with the Gas Companies; and then contracts would be made as usual—a certain cement maker agreeing to take a certain quantity from one or other of the Companies, just as at present.

Now for the knotty point of price. It will be to the interest of both parties that this should not be subject to violent fluctuations. I propose a sliding-scale, based on the selling price of cement, for ascertaining which, I think, means may be found, though I am told it is a difficult matter. However, where men have the will, difficulties can be overcome. The first difficulty will be to fix the standard or initial prices for cement and coke. With cement selling (say) at 23s. per ton net, what should be the price of coke? Then for every variation of (say) 1s. in the price of cement, what should be the variation in the price of coke? It is not impossible, I am sure, to arrive at fair figures; for during the last nine months I have been considering the matter, and have very nearly solved the problem—so far, at any rate, as to have come to a practical, although a tentative, agreement with one of our largest customers.

It will probably be said that the above proposal omits one important element—viz., the price of coal. For instance, if coal were always at one uniform figure, it would be quite fair to regulate the price of coke by the price of cement. But coal may go up at the same time that the price of cement falls. It would then be unfair to the Gas Companies to require them to sell their coke at a lower rate when it costs them more to make it. There is something in the point, but not much, because it relates to purely exceptional circumstances. Only twice in my long experience has there been a notable rise in the price of coal—viz., in 1872-5 and 1890-3. When these exceptional circumstances arise, I have no doubt reasonable men on both sides will be able to deal with them; and seeing that the sliding-scale agreement would be terminable on (say) six months' notice on either side, I do not think it desirable to provide, in the agreement, for the rare contingency of an appreciable rise in the price of coal. Sliding-scales, if simple, and based on one or two plain elements, are admirable and easy to work.

But every additional factor introduced complicates the machinery and increases the difficulty in geometrical proportion; so that the system, if at all complicated, soon breaks down.

I think now is the time to make a real effort to devise a system that shall be beneficial both to the Gas Companies and the cement makers. This is my only excuse for the great length of this letter.

*Reigate, Feb.* 22, 1896. GEORGE LIVESEY.

P.S.—Allow me to add here a few words to the following sentence in the first "Editorial Note" in last Tuesday's "JOURNAL." You say: "When The Gaslight and Coke Company buy coal, they insist on a clause in the contract providing that the South Metropolitan Company shall not purchase from the same contractors at a lower rate." I should not complain of this if it only applied to the current season; but the words "in the following year" ought to be added, which is quite another matter. It certainly does the Chartered Company no good; its only tendency being to keep up the price of coal.—G. L.

### Horseferry Road and Coke.

SIR,—The wail of the London cement maker is nothing compared to the cry of anguish of the Continental gas manager, whose business in coke has been almost ruined by the gentlemen who preside over the Residuals Department of The Gaslight and Coke Company. Year after year, immense quantities of Beckton coke are poured into the Continental markets; and what is more galling, it is advertised in the local papers as being quite a superior article! This stuff is usually put on board at 10s. per ton or less—being often brought out as ballast; and when the "drawback system" was in vogue, the London shipper (another mysterious gentleman) could afford to sell it almost at the same price for the drawback alone. Thank goodness this is now stopped! While coke has been denied the cement maker at 13s. per ton, it has been sold by thousands of tons for export at less than 10s.

Of course, the cement maker must have coke. Consequently, he looks round the Provinces, and I have been told is supplied from the large Midland municipal works at something like 6s. per ton, while the said municipalities have been taking a 10s. to 12s. yard price from their poor constituents! Two years ago, incredible as it may seem, the Midlands were sending thousands of tons monthly to the Thames; while at the time the yards of The Gaslight and Coke Company were overflowing. *O tempora; O mores!*

*Feb.* 20, 1896. A CONTINENTAL SUFFERER.

### The Chartered Gas Company and their Coke Sales.

SIR,—There is one important point in the coke controversy, I do not see taken note of. It is, of course, right of the "powers that be" at Horseferry Road to do the best they can for the shareholders; but it seems to me that this is not the case at present. An abatement of 3d. per ton on the cement makers' coke, would mean, roughly (say), about £4000. From inquiries I have made, Horseferry Road means spending twenty times this amount in attempting to browbeat the cement makers by sinking coke in the Marshes, &c. Surely we shareholders ought to be considered also; and I would like to remind Colonel Makins that it is our money, not his, that is being employed for these purposes.

It is very dazzling to be told that an undivided balance of £164,000 is carried forward; but on looking carefully into the accounts, one finds apparently £92,000 taken from this same undivided balance to pay the December dividend.

Even after trusting to sulphate going no lower, where is our June dividend coming from, if £100,000 is swallowed up in this coke affair? I hope history will not repeat itself as in the case of the Dock Companies years back. Their stocks were quoted at a "giddy height," and were looked upon as gilt-edged investments until they commenced fighting. Where are they now?

1, *Lancaster Place, W.C., Feb.* 21, 1896. E. TODD.

### Obtaining Receipts from Workpeople for Wages.

SIR,—Noting in your issue for Jan. 21 the query of "X. Y. Z." in regard to the matter of obtaining receipts from workmen for wages, I should like to give some details of our methods and experience in the Laclede Gaslight Company, in case American practice may interest some of our British cousins.

An early plan was to prepare a large sheet properly ruled, each line bearing the name, number, days, rate, and total amount due to a workman; the signature of each man being obtained in a space at the right hand on the same line. This roll was then a complete receipt for the period to which it referred; and it was filed away when all had been paid. Considerable care was, however, necessary to keep it clean when the men were signing; and, unless closely watched, a signature was often placed on a wrong line, or similar errors committed.

The plan which superseded this was the use of a small receipt-card or slip for each man, printed thus:

No..... .....189

Received of THE LACLEDE GASLIGHT COMPANY $....., for amount due to me on Pay-Roll ending this date.

.....

Before paying the men, the proper blanks were filled with the date at which the pay-roll closed, and the workman's roll-number and the amount due; while his name was written in pencil at the top. These slips were then assorted in alphabetical order. On pay-day the paymaster appeared with the money in small individual envelopes, each bearing an employee's name, number, and amount, made up from the prepared roll, and agreeing with the corresponding figures on the receipt-slips. On entering the office for payment, the workman was given his slip by the clerk. A standing-desk was provided outside the office rail, where each man signed his slip, and then presented it to the paymaster. The latter compared the name and figures with those on the envelope of the same number; and if all agreed, he took the slip and gave the envelope.

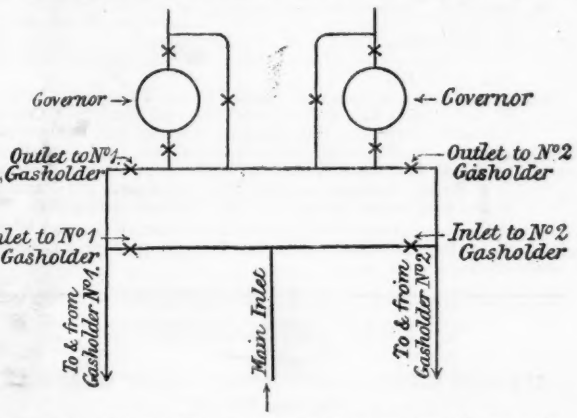
While this plan may seem complicated in the description, it was by no means so in operation, but proved admirably adapted to our requirements. It would be still in use but for the fact that sending large amounts of money to the outlying works was deemed somewhat hazardous; and the system of paying by bank cheques was adopted instead. These are of the usual form, but with the addition of a line, below the one bearing the amount, reading: "For services in full to ....."—the date being added; thus constituting the cheque itself a sufficient receipt, on endorsement. As there happens to be a bank quite near each of our principal stations, no difficulty ensues as to cashing the cheques. Indeed, any of the stores in the neighbourhood will also cash them without discount, as such action usually leads to trade; and many of the men prefer to obtain the money at shops near their homes. Some of them have also opened savings accounts at the banks on which the cheques are drawn.

We have the cheques engraved in blocks of 100 each, and machine numbered. Instead of a cheque-book with stubs being necessary, the regular pay-roll book is used for a check register, by placing the check numbers in an appropriate column in the record. All errors in putting up money are thus avoided; and in the unlikely event of a mistake occurring, it can be readily traced, and corrected with absolute justice.

*St. Louis (Mo.) Feb.* 5, 1896. GEO. T. THOMPSON, Superintendent (Station B), Laclede Gaslight Company, St. Louis, Mo.

### A Single Pipe for Gasholder Inlet and Outlet.

SIR,—In reply to the inquiry of Mr. John Campbell, in the last number of the "JOURNAL," *re* a single pipe as inlet and outlet to a gasholder, I may say that I adopted this method in the gasholder connections of the works which I constructed in the city of Buenos Ayres. There were two gasholders; and the connections were brought together in the governor-house, and arranged in such a manner that the man operating the valves worked them just as if there existed separate inlet and outlet pipes to each holder. This will be explained by the




accompanying sketch. The arrangement does not provide for additional holders being connected; but in the case in point, as the works were built complete to start with, no extensions were anticipated.

As to the efficiency of the device, not having personally managed these works, I can only speak from hearsay. There has not been, to my knowledge, any complaint made against it; and from all reports I have received, that part of the arrangements on the works has worked satisfactorily, as well as all other parts.

With regard to the general question of the advisability of adopting such an arrangement, I should say that wherever the coal carbonized is of one class, and a fairly uniform quality of gas is produced from hour to hour, no inconvenience would be experienced; but that where many different kinds of material are carbonized, and a uniform quality on the inlet-main is a difficulty, while a constant standard quality must be maintained on the outlet-mains, objection might exist against such a disposition. Even then, if the arrangement provides, as in the case referred to, for always working into one and out of another holder, no serious disadvantage could result.

*Manchester, Feb.* 19, 1896. G. E. STEVENSON.

**Gas-Stove, &c., Show-Rooms at Gravesend.**—In order to encourage the demand for gas-fires for cooking and heating purposes, the Gravesend and Milton Gas Company have decided to open special show-rooms at Berkley Crescent, Gravesend, where various patterns of heating and cooking stoves, regenerative and other lamps, cooking utensils, &c., may be seen in use.

**The Bolton Gas Committee and Mechanical Stoking.**—The Sub-Committee of the Bolton Town Council appointed to consider the question of introducing mechanical stoking at the two gas-works owned by the Corporation have reported in favour of the change. The members of the Sub-Committee visited Glasgow, and gleaned a great deal of information on the subject. They estimate that the adoption of mechanical stoking at Bolton will save £20,000 per annum as compared with hand-stoking. A special meeting of the Gas Committee was held on Friday. The recommendation of the Sub-Committee was adopted; and tenders were ordered to be obtained for supplying the necessary apparatus. At the same meeting, an application of the gas workers for an alteration in the terms of their employment was considered; but only that part in which they ask to be paid time and a half for three shifts on Sundays—instead of only two, as at present—was acceded to, and this conditionally upon the coal carbonized being increased from 3 tons 8 cwt. to 3 tons 10 cwt.

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bills presented and read the first time: Birmingham Corporation Water Bill, Drogheda Corporation Bill, Dublin Corporation Bill, Falkirk and District Water Bill, Malvern Link Bill, Manchester Corporation Bill, Padiham Urban District Council (Water) Bill, Ystradyfodwg Urban District Council Gas and Water Bill. [All these Bills, with the exception of the last, were subsequently read a second time.]

Bills presented, read the first time, and referred to the Examiners: Aldershot Gas and Water Bill, British Gaslight Company (Norwich) Bill, Cheltenham Gas Bill, Cowes Gas Bill, East Surrey Water Bill, Newcastle-upon-Tyne and Gateshead Gas Bill, Redheugh Bridge Bill, Ystrad Gas and Water Bill.

Bill dropped: Cheltenham Corporation Gas Bill.

## HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Suspended Bills (Session 1895): The Barnsley Corporation Water Bill, the Dewsbury and Heckmondwike Water Bill, the Rotherham Corporation Bill, and the Chelsea, East London, Grand Junction, Kent, New River, and West Middlesex Water (Transfer) Bills were read the first time, and ordered for second reading. The Chelsea Water Bill, Lambeth Water Bill, Lambeth Water (Transfer) Bill, and Southwark and Vauxhall Water (Transfer) Bill were read the first and second time and committed.

Bills read the first time: Barry Urban District Council Bill, Bilston Improvement Bill, Brighton Corporation Water Bill, Burton-upon-Trent Corporation Bill, Chester Corporation Bill, East London Water (Height of Supply) Bill, Edinburgh Extension Bill, Huddersfield Water Bill, Kent Water Board Bill, Kirkcaldy and Dysart Water Bill, Lanarkshire (Middle Ward District) Water Bill, Leamington Corporation Bill, London Sea Water Supply Bill, Matlock Bath Gas Bill, Sheffield Corporation Water Bill.

Bills read the first time and referred to the Examiners: Bexhill Water and Gas Bill, Bournemouth Gas and Water Bill, Colwyn Bay and District Gas Bill, Eastbourne Water Bill, Fylde Water Bill, Guildford Gas Bill, Ilfracombe Gas Bill, New River Company Bill, Porthcawl Water Bill, Portsmouth (Borough) Water Bill, South Metropolitan Gas Bill, Southwark and Vauxhall Water Bill, Staines Reservoirs Bill, Whittington Gas Bill.

A petition was presented against the Bournemouth Gas and Water Bill, and one for an alteration in the law in regard to District Councils' water supply.

# LEGAL INTELLIGENCE.

## SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

**Monday, Feb. 17.**

(*Before Lords Justices* LINDLEY, SMITH, *and* RIGBY.)

**Hardaker and Another v. The Idle District Council and Another.**

This was an application by the plaintiffs for judgment against the Idle District Council for a sum of £45, being the amount of damages assessed in an action tried at Leeds in December last, against the present defendants and one Thornton, a Contractor. [The case was reported in the "JOURNAL" for Dec. 17, 1895, p. 1247.] Mr. Justice Wright, before whom the action was tried, held that the Council were not liable; but plaintiffs, failing to obtain the damages from the other defendant, lodged this appeal, which was argued on the 17th ult.

Mr. TINDALL ATKINSON, Q.C., and Mr. LONGSTAFFE appeared for the plaintiffs; Mr. KERSHAW, Q.C., and Mr. WAUGH represented the District Council.

Lord Justice LINDLEY, in delivering judgment to-day, said the Idle Local Board in October, 1894, served on Mr. Hardaker a notice, under the Public Health Act, to sewer a portion of a street on which his house abutted; and on his failing to do so, they undertook the work themselves, by virtue of the powers given by the Act. For this purpose, they entered into a contract with the defendant Thornton; and one of the questions raised was whether or not he was merely their servant—thus rendering them liable for any act of negligence on his part, as in the ordinary case of master and servant. His Lordship read several clauses in the contract, which, among other things, made the Contractor subject in a very special manner to the orders of the Surveyor of the District Council, besides prescribing the precautions to be taken with regard to any water or gas mains which were interfered with in the process of making the sewer. While the work was being carried out, a gas-main was met with; and it appeared that, not being properly supported, it broke, and the gas found its way into the plaintiffs' house, where it caused an explosion, which injured Mrs. Hardaker, and did damage to the furniture. At the trial, the learned Judge directed judgment for the Council, on the ground that they were not responsible for the negligence of their Contractor; but against the latter the jury found a verdict for £45. His Lordship then went in some detail into the law upon the subject, and discussed a considerable number of previous cases. In the result, he came to the conclusion that the Contractor was not the servant of the Council, so as to make them responsible as his employers. On the other hand, they had a duty to perform towards the plaintiffs and all other members of the public, to prevent any damage arising from the execution of the works they undertook. This liability they could not escape by employing an independent Contractor to do the work; and they were therefore responsible for the damage. A defence had also been raised that the damages were too remote; but on this point, very little need be said. It was the nature of gas to escape, and find its way wherever it could, and, when mixed with air, to explode when brought in contact with a light; so that the damages were the direct and natural result of the negligence. The appeal must therefore be allowed, and judgment entered for the plaintiffs against the Council.

Lords Justices SMITH and RIGBY read judgments to the same effect; the latter expressing the further opinion that, under the peculiar terms of the contract in question, the Contractor was the servant of the defendants, and made them liable in this capacity also.

### The Incandescent Gas-Light Patents.

In the Queen's Bench Division of the High Court of Justice yesterday, before Justices Wills and Wright, a motion was made by the defendants in the case of *The Incandescent Gas-Light Company, Limited, v. The Sunlight Incandescent Gas-Light Company, Limited, and Others*, to commit Mr. Moeller, the Managing-Director of the plaintiff Company, and Messrs. Faithfull and Owen, their Solicitors, for contempt of Court, in sending threatening letters to defendants' customers, contrary to the order made by Mr. Justice Wright in June last, when he refused to grant an interlocutory injunction, at the instance of the plaintiffs, against the defendants. Mr. Roger Wallace, Q.C., and Mr. Jenkins, appeared in support of the motion; Mr. Terrell, Q.C., and Mr. Gray, for Messrs. Faithfull and Owen; and Mr. Walter, with Mr. Moulton, Q.C., for Mr. Moeller and the plaintiff Company. After considerable argument, their Lordships dismissed the motion with costs as against Messrs. Faithfull and Owen, who appeared to have acted properly in pursuance of instructions received from the Company, and also against Mr. Moeller, who was abroad at the time; but in his case without costs, as the Court thought he ought to have given more precise instructions to his subordinates. They ordered the plaintiffs to pay the costs of the motion, as, in their opinion, there had been a breach of the order.

### Removing a Parish Council's Lamp.

At the Divisional Petty Sessions held at Northampton on the 15th inst., Mr. J. Francis, a farmer, from the village of Moulton, was fined £1 and 17s. 6d. costs, for removing a lamp which had been fixed to his property by the Parish Council. The Bench ruled that the defendant had acted beyond his rights in removing the lamp. The village adopted the Lighting and Watching Act on Jan. 17 last, at a parish meeting.

### A Disputed Contract.

At the February sitting of the Kingston (Surrey) County Court, on the 14th inst., the Hampton Court Gas Company were the defendants in an action brought by Messrs. Baron and Co., Limited, engineers, of Hampton Wick, in respect of £23, the price of a ventilator. Against this claim, the Company put a set-off for £15 odd for coke supplied. Mr. M'Mahon, barrister, appeared for the plaintiffs; Mr. Scarlett, for the defendants. Mr. M'Mahon said that in August, 1894, Mr. F. Baron, then trading as Messrs. F. Baron and Co., submitted an estimate to the defendants for making a ventilator for a coal-store; and, the terms being acceptable, the order was given. Towards the end of the month, the business was converted into a limited liability company, and was registered on the 1st of September. On the 5th, the ventilator not having been supplied, Mr. W. E. Price, the Manager of the gas-works, had an interview with Mr. Symonds, the Manager of the new Company; and it was the plaintiff's case that on this occasion a new order was given in respect of the ventilator, and that the order was then executed. The work was finished in October; but when the invoice was sent in, the Gas Company claimed a set-off in respect of coke supplied to Mr. Baron, but with which the new Company had nothing to do. Mr. Symonds gave evidence in support of this statement. In cross-examination, he admitted that the Company was practically a partnership between Mr. H. W. A. Keyl and Mr. Baron; the other five shareholders being principally in the service of the Company, and each holding one share only—the value of the shares being £1 each. For the defence, Mr. Price was called, and denied that he gave a fresh order to Mr. Symonds as, at the time of the interview, he was not aware of the constitution of the new Company; no notice of assignment or registration having been given to the Gas Company. Witness had always regarded Mr. Symonds as the agent of Mr. F. Baron; and he knew nothing of the exact relations between the old firm and the new Company. The Gas Company relied entirely on their contract with Mr. Baron, who had ordered and received coke from them to the value of £15 5s. 6d. Mr. Scarlett said a more "one man" company than the plaintiffs' had never been heard of. However, his clients were entitled to succeed, as their contract was with Mr. Baron only. Judge Vernon Lushington, having elicited that the counter-claim would not be pressed in the event of his deciding that no order was given by the defendants to the plaintiffs, said the question was whether a new order had been given; and on that point he preferred the evidence of Mr. Price. He therefore held that no express order had been given by him. The Gas Company relied on their contract with Mr. Baron; and it was only common sense to assume that they regarded the new Company in the place of the old one. If people thought fit to turn themselves into limited companies with only nominal shareholders, as in this case, they must take the consequences. He non-suited the plaintiffs.

**Ipswich Corporation Water-Works.**—The Ipswich Corporation are about to make application to the Local Government Board for sanction to borrow £5000 for water-works purposes; the principal portion being required for main extensions.

# MISCELLANEOUS NEWS.

## CHESTERFIELD GAS AND WATER WORKS ARBITRATION.

**Surveyors' Institution, Westminster—Thursday, Feb. 20.**

(*Before Sir* GEORGE B. BRUCE, *Umpire.*)

The proceedings were resumed to-day in the arbitration between the Chesterfield Water and Gas Company and the Chesterfield Gas and Water Board, to determine the amount to be paid for the Company's undertaking. Sir FREDERICK BRAMWELL, F.R.S., representing the Company, and Mr. CORBET WOODALL, M.Inst.C.E., the Board, sat with the Umpire as Referees.

Mr. C. A. CRIPPS, Q.C., M.P., Mr. R. M. BRAY, and Mr. A. J. RAM appeared on behalf of the Chesterfield Water and Gas Company; while Mr. R. D. M. LITTLER, C.B., Q.C., and Mr. J. D. FITZGERALD, Q.C., represented the Gas and Water Board.

The proceedings on the 8th inst. closed with Mr. Littler's address for the Corporation; and to-day witnesses were called in support of their case.

Mr. *John Middleton*, Town Clerk of Chesterfield, and Solicitor to the Gas and Water Board, examined by Mr. FITZGERALD, stated that the price of gas for public lighting was 3s. 3d. per 1000 cubic feet until 1892, in which year the borough was extended, and the maximum charge raised to 4s. In most cases, the maximum was exacted; and, in addition, a charge for lighting and extinguishing was made. This latter charge had been as low as 15s.; but it stood at 21s. in 1893, and was then again increased to 25s. per lamp per year. In 1893, representations were made to the Corporation with regard to installing the electric light; and, as a consequence, they consulted Mr. Schoolbred, an electrical engineer. Witness then sent out a number of circulars to residents of Chesterfield, asking whether they would take the electric light; and he received some replies inquiring the charge. As a result, he was directed to take steps towards obtaining a Provisional Order; and an Order was secured in 1894. When the Corporation first moved in this matter, they did not know that the Company intended to go to Parliament in connection with their undertaking. As long ago as 1884, there was a great scarcity of water in Chesterfield; the reservoirs being perfectly dry. In 1887, the scarcity was so great that the Corporation had to open old wells to relieve the want; and the Company paid the Corporation some £47 for these services.

Mr. FITZGERALD: In 1893 had you for the third time a great scarcity of water?

*Witness:* Yes, there was a great scarcity.

Might it be described as a water famine?—Certainly.

In further examination, witness said that all parts of the town suffered, some houses being without water for several weeks; and the Company's reservoirs were, he believed, dry. It was in these circumstances that the Company promoted their Bill of 1894 for an increased supply. In the Bill, as deposited, it was proposed to largely increase the water-rates. A house paying then a water-rate of 6s. per annum, would, according to the Bill, have had to pay no less than 17s. 4d. if within the borough, and a third as much again if outside. Further, it was proposed to make an extra charge of 10s. for each house with a closet supplied with water. The greatest increase would be on the small houses—those under £10 a year, which formed the great majority in Chesterfield. In the borough, these were 74 per cent. of the whole; and in the Company's district generally, they formed from 91 to 97 per cent. Witness was instructed to take the necessary steps to oppose the Bill, in conjunction with neighbouring authorities; and he did so. The petitioners against the Bill objected to the further capital asked for, on the ground that the Company already had large capital powers which they had not exercised. The Corporation then passed a resolution in favour of acquiring the water portion of the undertaking, which was all the Bill related to; their intention being to cease supplying the Brimington district, which could be served by the Rural District Council. In this way, there would be sufficient water for the town of Chesterfield. The obligation to take over the gas portion of the undertaking was placed upon the Council by the Committee of the House of Commons, although they had never wanted to take this part of the concern over. There had been constant complaints as to the 3s. or 4s. per 1000 feet charged for the gas; the rate being considered excessive, as the town was so near a coalfield. Then there were complaints as to the quality and pressure. He produced a table, showing that in the Company's district of supply there were 9294 houses, of which 7857 were under £10 rateable value; and he did not think these small houses were supplied with gas. The number of gas consumers was 1234. Witness then explained the railway development that had taken place in connection with the town in the last few years, and its effect; asserting that trade and traffic had been taken rather to Sheffield than to Chesterfield, and that though the construction of new lines had involved the demolition of some houses in Chesterfield, none had yet been erected in their place. He never knew the trade of the town to be worse than it was now. In the small houses and in shops, oil was commonly used for lighting purposes—in the Market Place and adjoining streets, there were 177 shops lighted by oil.

The UMPIRE: How many would there be over the same area lighted with gas?

*Witness:* As many. Continuing, witness said the electric light had been adopted in a number of factories; and, as far as he knew, it was successful. In Chesterfield, in 1894, 105 new houses were built; and in 1895, the number was 124. But in the first-named year, the Medical Officer condemned 133; and in 1895, 302. It did not follow that the condemned houses had all been closed. The Medical Officer recommended that there should be water-closets in the smaller houses; but the Council had not been able to carry the recommendation into effect, chiefly because of the scarcity of water. In the beginning of 1894, there was a great want of water, which was not entirely due to the frost, because in some cases residents would put a pail under the water-tap at night and get a few pints by the next morning; showing that water must have been passing through the pipes. In April, two memorials were presented to the Corporation—one signed by 433 inhabitants, complaining that the water supply was insufficient for cooking purposes.

Mr. FITZGERALD: From August to November there was a great scarcity of water?

*Witness:* There was.

How long were some parts of the borough without water?—Two months at least.

In further examination, witness stated that the charge of the Whittington Gas Company, who covered a neighbouring district, was only 3s. 3d. per 1000 cubic feet.

In cross-examination by Mr. CRIPPS, witness admitted that if a greater sum than 25s. had been asked for lighting and extinguishing the gas, the Corporation would have had to pay it.

Mr. CRIPPS: As to the scarcity of water in 1894, are you aware that the water was run off the reservoir because there was a bit of a scare, a Sheffield reservoir having burst?

*Witness:* I know that was done; but there was also a scarcity of water in the town. In 1887, he believed the scarcity was in October.

Mr. CRIPPS said he could not understand this, as the Company's record showed that there was plenty of water then.

*Witness:* I know it was in that year that the Company paid the £47 to the Corporation.

Do you base what you say about the scarcity of water in 1887 on the £47 paid to the Corporation?—Yes, quite so.

Questioned as to the increased charges which the Company proposed to impose according to the Bill they promoted, witness said the amount of the increase might have been reduced subsequently—the Bill was constantly being altered. Since 1894, Chesterfield had not increased so much as in the two previous years, as was shown by the rateable value; nor did he think that there was an increasing population in Chesterfield.

Mr. CRIPPS: Do you know that in 1894 there were 318 new services within the water district?

*Witness:* I do not know that. Do you mean new ones simply?

Mr. CRIPPS: I am only taking the new services.—Well, I have got the increase in the number of houses supplied. In 1893, there were 8745; in 1894, 9113; and in 1895, 9341.

*Witness* pointed out that these figures made no allowance for houses which had ceased to take water. He could not say how many of the 302 houses condemned by the Medical Officer had been closed. If a house were condemned and not closed, it was usual to go to the magistrates and obtain an order. Three such orders had been made out in connection with the 302 houses.

In re-examination by Mr. FITZGERALD, witness said that there had never been so many lamps in use as there were at present.

Sir F. BRAMWELL remarked that it was not so much the number of lamps as the number of hours they were alight, which accounted for the consumption of gas.

*Witness* (continuing) said that in 1892, and since then, they had simply lit the added areas the same as they did before, owing to the fact that these areas paid less rates than the old borough. With regard to new water-works, it had been proposed to spend £90,000 on them; and it was not known until the Bill came before the Committee of the House of Commons that the works would cost £120,000.

Mr. *Alfred Lass*, of the firm of Alfred Lass, Wood, and Co., Chartered Accountants, was then examined for the Corporation; the basis of his evidence being a report furnished by him upon the accounts of the Chesterfield Water and Gas Company on behalf of the Corporation. He said his firm inspected the accounts of the Company and had prepared tables giving the following particulars: (A) The capital and maximum dividends authorized; also the amount of capital paid up, issued but not paid up, and remaining to be issued, on Dec. 31, 1894. (B) The loan capital authorized; also the amount borrowed and the amount remaining to be borrowed on Dec. 31, 1894. (C) The stock, share, and loan capital raised, premiums received and the amount received on the sale of the Forge Works, during each year from 1890 to 1894. (D) The capital expended on the water undertaking, and the capital expended on the gas undertaking, for each year during the five years 1890 to 1894; together with the capital raised and the balance of capital in hand or overdrawn. (E) The dividends paid from 1875 to 1894. (F) The gross and net rateable value of the water and gas undertakings on Dec. 31, 1894. (G) The registration sub-district and civil parishes of Chesterfield, as per census returns. (H) The scale of charges for the supply of water authorized by the Company's Special Act of 1865, together with the charges made by the Company. (I) The water-rents for each quarter, and for each year from 1885 to 1894. (K) The estimated total quantity of water supplied for domestic and other purposes, the estimated average daily supply, the number of houses supplied, the estimated population supplied, the estimated daily supply per house and per head of estimated population; together with the average number of persons supplied per house, for each year, from 1890 to 1894. (L) The number and sizes of water-meters on hire on Dec. 31, 1894, and prices charged per annum for the hire thereof. (M) The capital expended per million and per thousand gallons of water supplied; also the income, expenses of working, and profit on water, the proportion of expenses to income, and calculations per thousand gallons of water, for each year from 1890 to 1894. (N) The quantity of gas made, sold, used on works, and accounted for, from 1884 to 1894. (O) The number and sizes of gas-meters on hire on Dec. 31, 1894. (P) The number of consumers of gas in each district on Dec. 31, 1894. (Q) The prices charged per annum for the hire of gas-meters. (R) The prices charged to gas consumers, and for public lighting, for gas supplied per 1000 cubic feet, from 1884 to 1894. (S) The capital expended per million and per thousand cubic feet of gas made and sold, and per ton of coal carbonized; also the proportions of gas made, sold, used on works and unaccounted for, residuals produced, and average prices realized, for each year from 1890 to 1894. (T) The expenses of working, the income, and the profit on gas, with calculations per ton of coal carbonized, and per 1000 cubic feet of gas sold, for each year from 1890 to 1894. (U) The profit on water, profit on gas, income-tax, interest on mortgage bonds, dividends paid, and

surplus or deficiency, for each year from 1890 to 1894. (V) Statement of the accounts of the Company for the year ended Dec. 31, 1894. In regard to auction clauses and premiums, witness showed that the following capital was subject to the auction clauses: £20,000 under the Company's Special Act, 1855. The premiums upon the sale of this capital were applicable to the general purposes of the Company, but not entitled to dividend. £27,000 under the Company's Special Act, 1865. The premiums on the sale of this capital were to form part of the reserve fund, and not entitled to dividend. There had been placed to the credit of the reserve fund for "sundry premiums" the sum of £46 9s.; and there was now standing to the credit of the capital account, as premiums on the sale of shares, the sum of £1347. By section 15 of the Company's Special Act, 1865, the amount of the reserve fund was limited to £5000; but this was repealed by section 18 of the Company's Special Act, 1871, which stated that the provisions of the Water-Works Clauses Act, 1847, and the Gas-Works Clauses Act, 1847, with respect to a reserve fund should apply to the Company. The amount standing to the credit of the reserve fund on Dec. 31, 1894, was £206 17s. 4d.; and the amount invested in the purchase of £158 14s. 3d. of 2¾ per cent. consolidated annuities on account of the above was £145 13s. 7d.—leaving £61 3s. 9d. to be invested. The amount of reserve fund authorized was one-tenth of £239,200; so that the fund was not full to the extent of £23,713 2s. 8d.

Sir F. BRAMWELL asked if there was any compulsion on the Company to establish a reserve fund, apart from the application of the premiums under the auction clauses to that purpose.

*Witness* replied in the negative.

Mr. WOODALL inquired if there was any obligation on the Company to put premiums to the reserve fund.

*Witness* said there was, under the Company's Act of 1865.

What would be done with the money when it is put to the reserve fund?—It stands there now.

But could it be used?—Yes, as an ordinary reserve fund.

Mr. WOODALL: In making up dividends, for instance.

Sir G. BRUCE remarked that the table in regard to dividends did not come out at as much as the tables already put in.

Mr. FITZGERALD said the Company had £20,000 preference shares and £8000 guaranteed stock, together with a further £21,000 preference stock. All these bore a maximum dividend of 5 per cent. Then there was £11,200 ordinary stock, which had a maximum dividend of 10 per cent. The remainder of the stock was ordinary shares, with a maximum dividend of 7 per cent.

*Witness*, in further examination, said in 1880 the Company were paying the maximum dividend on ordinary stock; but from that time, there was a rapid decline. In 1881, it was 6 per cent.; and in 1882, £5·9 per cent. In 1886, it got down to 4½ per cent. For a number of years they were paying 5 per cent. In 1892, it rose to 6 per cent.; in 1893, it fell to 5½ per cent.; and in 1894, it got up again to 6¼ per cent.

Mr. FITZGERALD: I do not know whether this arbitration has anything to do with that.

*Witness* (continuing) said Table F showed that the net rateable value of the water undertaking was £3344 17s., and of the gas undertaking £4628; giving a total of £7972 17s. The figures had been agreed upon by himself and Mr. Brining. On reference to Table M, it would be seen that the capital expended on the water undertaking amounted on Dec. 31, 1894, to £89,852. The expenditure per million gallons in Chesterfield was £259, while the average of the London Companies was £229·86. The capital of the Chesterfield water undertaking did not compare very favourably with the London Companies, when the effect of pumping against gravitation was considered. It would be seen by that table that the Chesterfield working expenses for the year ended Dec. 31, 1894, amounted to 33·27 per cent. on the gross income. This sum of 33·27 per cent. included a charge for rates and taxes amounting to 15·54 per cent. on the gross income. The average working expenses for gravitation works were from 20 to 25 per cent. on the gross income; and assuming them to be 25 per cent., as against the actual expenses, 33·27 per cent., there was a difference of 8·27 per cent., which might practically be accounted for by the heavy charges for rates and taxes, which amounted to 15·54 per cent. for Chesterfield, as against the generally-considered heavy charge of 10·41 per cent., the average of the eight London Companies. The amount charged for repair and maintenance of works, reservoirs, mains, &c., for the year 1894, was 7·75 per cent. on the gross income in Chesterfield; while the average of the eight London Companies was 8·14 per cent. Notwithstanding this, the expenses for repairs and maintenance per cent. on the gross income should be somewhat increased, for the following reasons: No portion of the works and plant having been renewed, there were no charges against the revenue for renewals; no portion of the mains having been renewed, there were no charges against the revenue for renewals; and in 1894, 165 12-inch pipes (about 495 yards) were taken up and relaid in another part of the district. The labour for re-laying had been charged to capital instead of to revenue—495 yards, at (say) 3s. 6d. per yard for laying, £86 12s. 6d. The question was what additional charges (if any) should be made against revenue in respect of the above matters, after carefully considering the calculations set out in Table M. The amount, when ascertained, must be deducted from the profits of the year 1894, which amounted to £5307. The water supplied by meter amounted to 400,000 gallons per annum; the rate being 6d. per 1000 gallons. This rate was fixed by Act of Parliament.

Sir F. BRAMWELL: Are the Company bound to supply water by meter at that charge?

Mr. FITZGERALD said the Company were not entitled to charge more than 6d. per 1000 gallons.

Sir F. BRAMWELL: Is there an obligation to supply the 400,000 gallons?

Mr. FITZGERALD: So long as they do not prejudice the domestic supply. The ordinary provision of a Water Act is not that they are bound to supply for domestic use, but that they may supply for trade purposes, and may charge what they like.

Mr. CRIPPS maintained that these points were not material.

Mr. FITZGERALD said the Company were limited in their power of charging—that was all he desired to show.

Mr. CRIPPS held that this had no bearing on the question of the amount to be awarded to the Company.

Mr. FITZGERALD: It bears on the exact position of the Company, and what they can expect to derive their income from.

Mr. CRIPPS: We are only claiming on the basis of actual charges.

*Witness* then proceeded to give details as to the consumption of water and the number of persons in the town. In 1894, the estimated population was 47,590; and in 1893, it was 45,474—less than 46,000. This was the year in which it was said that the water supply was insufficient. The increase in 1894, as compared with 1889, was 1·91 per cent. per annum compound. In the dry year of 1893, they supplied 32 million gallons, as compared with 31 millions in the previous year, and 27 millions the year after. The Company were selling for trade use, and cutting off the supply for domestic purposes.

Mr. CRIPPS: You cannot cut off the meter supply, having to keep your mains charged.

*Witness* went on to say that, with regard to Table N, showing the quantity of gas made, &c., he could not find in the Board of Trade returns any other town in Derbyshire which compared with Chesterfield. He found that the increase in the private lighting had been larger than in the public lighting, which was, to his mind, an abnormal state of things. The prices authorized to be charged by the Company after June 24, 1865, for a supply of gas were as follows—viz.: Not to exceed 4s. per 1000 cubic feet within the borough of Chesterfield, or within half a mile from the boundary thereof; not to exceed 4s. 6d. per 1000 cubic feet if supplied at a distance of more than half a mile from such boundary; not to exceed 5s. per 1000 cubic feet if supplied within the parishes of Whittington and Brimington. Table R showed that gas for many years past had been supplied at the following rates—viz: 4s. per 1000 cubic feet to ordinary consumers, subject to a discount of 5 per cent. on accounts of £25 and upwards; 3s. 3d. per 1000 cubic feet to large consumers; 3s. 3d. per 1000 cubic feet for public lighting. The quantity of gas supplied for public lighting, was ascertained in the following manner—viz.: Each burner is estimated to consume 5 cubic feet per hour, taking the average number of hours lighted per year. Table S showed that the capital expended upon the gas undertaking amounted on Dec. 31, 1894, to £92,446. The cost in Chesterfield per 1000 cubic feet of gas made was £1656; and per million feet sold, £1736. It was £1 14s. 9d. per 1000 feet sold, and £15 15s. 7d. per ton of coal carbonized. The average cost per 1000 feet sold by the three London Companies was 12s. 3d., and the average per ton of coal carbonized, £5 16s. 2d.; while the corresponding figures of the twelve London Suburban Companies were 13s. and £6 4s. 6d. For the eight large Provincial Corporations, the figures were 11s. 7d. and £5 5s. 10d.; and for the ten large Provincial Companies, they were 10s. 11d. and £5 3s. 9d. The cause of the high capital expenditure at Chesterfield was this: During the years 1870 to 1878, the Company, expecting a rapid development of the neighbourhood, erected new gas-works (adjoining the then and now existing works), at a cost of about £55,000, which had not been up to present time fully utilized. The total capital expenditure to 1870, was £29,006, to 1878, £88,694 (an increase in eight years of £59,688), and to 1894, £92,446 (an increase in 16 years of £3752). The charges for repair and maintenance of works, mains, &c., at Chesterfield for the year 1894 only amounted to 1·83d. per 1000 feet, against 5·17d. per 1000 feet for the three London Companies. The reasons, amongst others, were that the works and plant had not been renewed (except retorts), consequently there were but few charges against the revenue account for renewals; the gas plant had been thrown out of action, and no charge had been made against the revenue account therefor; and no mains had been taken up and relaid, consequently there were no charges against the revenue account for renewals. The working expenses per 1000 cubic feet for the year 1894 were: In Chesterfield, 19·60d.; in the three London Companies, 15·86d. Included in the Chesterfield working expenses was 7·32d. per 1000 cubic feet for rates and taxes, as against 2·15d. per 1000 cubic feet for the three London Companies. The profit on gas for the year ended Dec. 31, 1894, was £4952 4s. 8d., or 22·32d. per 1000 cubic feet; and from this he deducted 3·17d. per 1000 on 53,245,000 cubic feet, £703 5s. 6d., or 3·17d.—making a total of £4248 19s. 2d., or 19·15d. He then deducted the stock of liquor, £100; reducing the profit for 1894 to £4148 19s. 2d. He had prepared a statement showing the capital expenditure on the water and gas undertakings from 1871 to 1894. For water, the amount expended up to Dec. 31, 1870, was £56,517 18s. 9d. To this must be added the sum since expended of £33,334 12s. 3d. Up to Dec. 31, 1894, the amount spent was £89,852 11s. As to gas, up to Dec. 31, 1870, the amount laid out was £29,006 7s. 7d., to which must be added the following sums since expended: New works, £55,534 5s. 8d.; new mains and services, £5424 4s. 7d.; meters, £1391 3s. 2d.; professional charges, £252 5s. 9d.; miscellaneous charges, £49 8s. 11d.; parliamentary charges, £788 6s. 4d.—total, £63,439 14s. 5d. Up to Dec. 31, 1894, the amount expended was £92,446 2s. The number of years' purchase of the Company's stock had varied from 22 to 26. Prior to the question of purchase being mooted, they had not risen above 23½ years' purchase. The rates on the gas undertaking were 8s. 4d. in Chesterfield; while in London they were only 6s. 4d. The reasons for this large amount in Chesterfield was, in the first place, that the rates generally were high; and, in the second, because they were on the whole property (a portion of which was lying idle, and therefore unremunerative), and not on the output of gas.

Mr. CRIPPS, in cross-examination: Are not the rates three or four times too high?

*Witness:* They are high, for the reasons I have given.

Apart from these reasons, are they not three or four times too high?—I have never made any alteration in the figures in respect of rates, or suggested it, as they are a definite quantity.

Mr. WOODALL asked if the rates were higher in 1894 than in 1893.

Mr. FITZGERALD said that no doubt they had gone up. The assessment was what it had been for some years.

In re-examination, witness said that the rates worked out at 10 per cent. on the gross income of the Company. In 1891, they were £1047; and in 1894, £1625—the assessment being the same.

Mr. FITZGERALD said his learned friend had suggested that the high

amount the rates and taxes was a novelty; but was it a novelty in witness's experience to endeavour to charge the amount paid on such taxation against a purchaser in an arbitration case like this?

*Witness* replied in the affirmative.

Did you ever know of such a thing in an arbitration case before?—No, I have never known a case in which an attempt has been made to deal with rates and taxes in the direction either of increasing or decreasing them.

Mr. FITZGERALD: My learned friend has there a greater novelty than the one he discovered.

Mr. *C. Portland Robinson*, lint and cardboard manufacturer, said he had known Chesterfield all his life, and was familar with the undertakings of the Water and Gas Company. In regard to gas, the pressure had been insufficient at his works; and as a consequence, he had had to adopt the electric light. Practically, in the course of the present year he would have ceased to burn gas for lighting purposes. He used a little for gas-engine purposes. But they could not continue to do so by reason of the price; and they were thinking of putting down plant for the manufacture of Dowson gas, which would effect a saving of 2s. or 2s. 6d. per 1000 feet. The electric light had been adopted at some local engineering works, a tannery, an iron works, and a wholesale grocers.

Mr. FITZGERALD: What is your view with regard to increase or decrease in the consumption of gas in Chesterfield if the present prices are maintained?

*Witness*: Well, the position is this: All the small consumers use oil; and there is practically no gas in the small houses. A great number of the large shops also burn oil, and the electric light is extending; so that unless the price of gas is reduced by 25 per cent. at least, it will shortly be of very little use in the town.

You do not think there is any likelihood of the consumption of gas increasing?—No; on the contrary, I think it will decrease.

Personally you are opposed to the Gas and Water Board acquiring these undertakings, are you not?—Yes. As a Corporation, we are going in for electric lighting; and between the question of oil for small consumers and the electric light for large ones, I believe the Gas Company would have been obliged so to reduce their price that they would have welcomed purchase by the Corporation at a very cheap rate in a few years.

A great deal has been said about the increase of Chesterfield. Is it not the fact that many trades have left the town of late?—Chesterfield has been extremely unfortunate as to its manufactures. Many years ago, there was a hat manufactory in the place; but that has quite ceased. We have also had lace manufactures, silk mills, fishing tackle manufactures, fell mongering, and tobacco-pipe making; but all these industries have ceased. In my recollection, there has been no new business started except Mr. Clench's for a number of years. Mr. Clench had established engineering works in the town.

In cross-examination by Mr. BRAY, witness said he was a member of the Corporation, and had no affection for the Company. He had paid 4s. per 1000 feet for gas for years—an amount he should not have been called on to pay. It was true that he had enlarged his premises last year; and it was then that he put up the gas-engine. They found it necessary to have additional power, and to consume an extra amount of gas; but they had determined, if they succeeded with the engine, to look out for Dowson gas. They adopted the electric light in 1894. He employed about 750 hands now; and in 1890, he had about 600. In the five years before that, he employed a still smaller number.

Mr. *Wilfred Edmunds*, Editor of the "Derbyshire Times," and manager of a printing and publishing business in Chesterfield, said he had seen the report of the evidence given by Mr. Jones, the Manager of the Water and Gas Company, and did not agree with it. He had published in his paper in August, 1895, a statement as to the possibility of a water famine taking place, and the steps to be taken for the avoidance of waste of water. The statement was brought by a Mr. Buckland from Mr. Jones; and a proof was sent to Mr. Jones and brought back by Mr. Buckland, with a message to the effect that it would do very nicely. He had "interviewed" Mr. Jones on Sept. 12 last; and before publishing anything had sent him a proof, without eliciting anything from him in the nature of correction.

Mr. LITTLER: Mr. Jones said the interview was exaggerated. Was that the fact?

*Witness*: He made no alteration in the proof.

On Oct. 12, did you publish a paragraph about "Chesterfield and its Water—Only One Week's Supply—Grave State of Affairs"?—Yes.

Who brought that to your notice?—Mr. Buckland.

Did he bring it to you personally?—He did. It was in the handwriting of Mr. Jones himself, with the exception of the heading. If Mr. Jones says the paragraph is not quite true, that is clearly his own fault.

He said he had never seen it at all till it was in the newspaper. Is that true?—It is absolutely inaccurate. I should not have thought of publishing the paragraph if I had not received it from Mr. Jones.

*Witness* went on to say that he had suffered considerable inconvenience at his works owing to insufficiency of gas. He had been compelled to replace gas with oil in his composing room. The water supply had also been deficient; and at one period, he had spent as much as £3 10s. in getting water carried to the works for boiler purposes. As to its quality, sometimes in the summer it was thick, and had a sediment if allowed to stand for an hour or two.

In cross-examination by Mr. BRAY, witness said he knew that Mr. Jones's object in the paragraphs he had sent to him was to bring about economy in the use of water. In January, 1894, the complaint he made was in regard to the water supply being short.

Mr. BRAY: The lower reservoir was full, and the other had somewhere about 40 feet of water in it. Was it not the fact that there was a severe frost?

*Witness*: There was a letter sent to me stating that the water-main had been broken by the passing of a steam road-roller over it; and it was suggested that I should store water to guard against accidents. The complaint made on March 14, 1895, was just after the severe frost. A complaint was made on May 3, 1895; and I then received a letter saying that the supply for trade purposes would henceforward be by measure. I have not complained in writing since then, though I have done so verbally. The occasion on which the water was thick was during the time of the drought, when the reservoirs were very low. As to gas, the pressure used to go down about 10 to 10.30 at night. I have not taken gas for the composing room since 1893. I have complained since then—on Jan. 16, when the Company sent an inspector to my works who said that the fault lay with the fittings.

Have they ever recommended any new fittings to you?—They have suggested new fittings; but I have found at times that we have too much gas. I have told them so; and I assume, rightly or wrongly, that the fault is with the Company, and not with the fittings.

Mr. *G. H. Hill*, M.Inst.C.E., said he had inquired into the conditions of the water supply of Chesterfield, and considered that 20 gallons of water per head was a low figure. If he were advising the town in the matter, looking to the requirements of the population for sanitary and other purposes, he should not be satisfied with less than 25 gallons per head. Eighteen gallons was distinctly too little. All great and populous towns containing a large working-class element had a supply of about 25 gallons per head; this quantity leaving a little margin for waste, and so forth. He did not believe that any buyer knowing the facts as to the position of the Company would dream of giving for it the number of years' purchase usual in cases of this kind. Witness produced several tables, from which it appeared that, since 1877, very little had been expended on the concern. If the Corporation took it over, they would have to spend on the water section £15,000 in the first year, £20,000 in the second year, and other sums in succeeding years. By his calculations, the capital expenditure necessary would cause the dividend on the total capital as it increased year by year to fall until, in 1902, they would be earning only a little more than ¼ per cent. That applied to the water part only, and was on the assumption that the profit increased £100 each year. They were already supplying 47,500 out of the 51,000 inhabitants. The extensions ought to have been taken in hand ten years ago. After this inquiry, he could not accept the dividend as an index of the position of the Company. In his opinion, 24 years' purchase was a liberal offer; and he did not think any question of compulsory purchase arose in a case of this sort. His estimate of the value of the whole undertaking was £103,200—that was 24 years' purchase of £4300.

In cross-examination by Mr. BRAY, witness said the amount of 20 gallons per head which he had allowed included the supply for trade as well as for domestic pusposes. He could not say how much would be used for trade, and how much for domestic purposes.

Mr. BRAY: In Sheffield the trade supply is 6·8 gallons; that would leave about 15 gallons per head for domestic use. Now would the domestic supply in Chesterfield be more or less than in Sheffield?

*Witness*: I cannot tell you, because I have not divided the figures. It depends upon the different trades in the district. The domestic supply varies in different places. In Edinburgh, it is 22 gallons per head. In the larger houses, the quantity used would be greater than in small ones, because of the baths and closets. Witness went on to state that the houses in Chesterfield were smaller than in Sheffield. He could not say that the domestic supply of Chesterfield would be smaller than at Sheffield. At Manchester, the domestic consumption was about 20 gallons per head per day. Up to two years ago, the consumption there per head was about 24 gallons a day; trade taking out of that 7 or 8 gallons a head daily. Since the new supply had been available, the consumption had sprung to 28 or 29 gallons per head daily; and, taking 8 or 9 gallons for trade, that left 20 gallons per head daily for domestic use. Before pledging himself to a statement that Chesterfield required 20 gallons per head, he did not think he ought to have gone into the figures. It was sufficient for him that the Engineers—Mr. Hawksley, Mr. Eaton, and others—had given that figure.

Mr. BRAY: If I tell you that the trade supply of Chesterfield is only 1½ gallons, do you not think 18 gallons sufficient for the town?

*Witness*: No, I do not, because I never took a case where it was less than 20 gallons; and then it is often too little. Continuing, he said that at Manchester, he was sure the jump in the consumption was not due to waste. In valuing, he had regard to the present rating of the concern. It would make no difference if he knew that the Corporation intended to raise the rating—he should make no allowance for it.

Mr. BRAY: If you were buying shares in the Company would you not be inclined to pay less if you knew the rates were to be raised £400 a year?

*Witness*: I do not know that I should.

The proceedings were then adjourned till the following day.

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**New Water-Works for Farnham.**—The Farnham Water Company have acquired a suitable site at the top of Gravel Hill, Farnham; and they will at once commence the construction of new water-works thereon. The chief part of the scheme is to build a new reservoir, capable of holding 500,000 gallons, and a filter-bed, at a height which will enable the Company to give an ample supply of water to the whole of the district.

**The Working of Coal Beneath a Proposed Reservoir at Morley.**—A special meeting of the Morley Town Council was held yesterday week, for the purpose of considering two communications from Mr. Joseph Haigh, the proprietor of the Victoria Collieries, Bruntcliffe, giving notice of his intention to work two seams of coal underneath the site of a service reservoir which the Corporation are about to construct. The Town Clerk (Mr. R. Burrough Hopkins) reported that, in accordance with instructions, he had obtained the opinions of Mr. Charles Gott and Mr. Garforth, of Normanton, with regard to the subject, and that, in their judgment, no damage would arise to the reservoir by the coal being won. One of the seams is 80 yards below the surface; and the other, 160 yards. The question the Council considered was whether they should purchase the seams. Mr. O. Foster, Chairman of the Water Committee, remarked that they had fully considered the question, and were of opinion that there was no necessity to do so; and he moved accordingly. Alderman Stockdale seconded the motion; but it was strongly opposed by Messrs. Scarth and Rhodes, who pointed out that they had already seen the effects of subsidence of land in Morley through the working of coal. The motion was carried, with only two dissentients.

## LIVERPOOL UNITED GASLIGHT COMPANY.

The Half-Yearly Meeting of this Company was held last Tuesday—Mr. H. B. GILMOUR (the Deputy-Chairman) presiding.

The SECRETARY (Mr. P. F. Garnett), having read the notice convening the meeting, submitted the report of the Directors, which recommended the declaration of a dividend for the half year of 5 per cent. on the ordinary consolidated "A" stock, and of 3½ per cent. on the 7 per cent. "B" stock.

The CHAIRMAN, in moving the adoption of the report, expressed his regret at the absence of Mr. Edward Lawrence through indisposition. Proceeding, he remarked that it was not the custom to present at this meeting any statement of accounts. At the same time, the Board felt they were quite justified in recommending the dividend named in the report; and they were also warranted in assuring the shareholders that the accounts were perfectly satisfactory. Unless the next six months greatly falsified their present prospects, they would have to deal with a profitable year on June 30. He was pleased to inform the proprietors that the consumption of gas was still progressing satisfactorily. They had not advanced by leaps and bounds as in former times; but there had been a steady increase during the half year, amounting to little short of 3 per cent. This was especially satisfactory in view of the unexampled mild weather through which they had been passing. Had the weather been of an ordinary wintry character, the consumption would unquestionably have been much greater. Meanwhile he had much pleasure in informing the shareholders that the consumption of gas during the twelve months ending Dec. 31 would prove to be the largest on record. In connection with this increase, they were naturally curious to learn what proportion was devoted to other purposes than illumination—namely, heating, cooking, and power—and although they could not possibly get definite statistics on the subject, they were satisfied that a great increase was taking place in this direction. It was an interesting piece of history that not more than five years had elapsed since they introduced the automatic system of supply. The idea was first taken up by their Company; and it had proved to be not only an ingenious, but a very useful and fruit-bearing contrivance. At present they had about 12,000 automatic meters in use. They were still fixing them at the rate of about 380 weekly; and orders were coming in much more rapidly than they could attempt to execute them. The only difficulty experienced was in getting sufficient meters. He sincerely hoped that they would supplant to a great extent those abominable paraffin lamps, which were the cause of so many frightful accidents and deaths. The incandescent gas-light was to his mind becoming a formidable rival to electricity. It was a better, purer, and more agreeable light than electricity; and to that extent, it strengthened the position of the Company as illuminant suppliers. While their consumption was thus growing, it was encouraging to know that to an appreciable extent the cost of production tended to diminish. This was not merely a question of the price of coal, but was rather a consequence of good management. Notwithstanding the extended use of electricity, they noticed a gratifying increase in the consumption of gas. The Company had now to face a more powerful form of competition in reference to electricity than before, having as rivals the Corporation. Though this might seem rather hard, and handicap them severely, they must meet it as best they could. The one point to remember was that electricity was not cheap; and so far gas had been able to keep ahead of it in the matter of price. Alluding to the residual products, the Chairman said they had been very disappointing during the six months. The prices and the demand for coke had been smaller; and they had also sustained a serious loss on ammoniacal liquor. As to the supposed differences between the Company and the Lighting Committee of the Corporation, he could refer to them with satisfaction. To judge from the amount and the tone of the newspaper correspondence during the year, it looked as if they had had to face serious troubles; but in point of fact, the difficulties were mainly, if not entirely, the outcome of misunderstanding and imperfect knowledge. When an opportunity arrived for calmly and quietly discussing these matters, the difficulties disappeared in a marvellous way. The Company had always been most desirous of working in a friendly and amicable spirit with the Corporation, and (always consistent with their obligations to the shareholders) were willing to meet them reasonably, and show that they did not forget that they owed some duty to the community at large. The Company had told the Corporation more than once that they had nothing to conceal—everything was at their disposal. As the result of a recent conference, he was glad to announce that their relations with the Corporation were now of the most friendly and pleasant nature; and he hoped they would always continue to be so.

Mr. J. B. SMITH seconded the motion.

Mr. G. H. BALL was glad to see that there had been a diminution in the cost of production; and he suggested that, in the preparation of the next annual accounts, a little more information should be given with regard to general contracts, the cost of coal, the illuminating power of the gas, and the cost of production per 1000 cubic feet.

The CHAIRMAN promised that the suggestion should receive the consideration of the Directors.

The report was unanimously approved; and the interim dividend recommended was declared.

A vote of thanks to the Chairman concluded the proceedings.

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**New Joint-Stock Companies.**—Under the title of the Central Compressed Gas-Works, Limited, a Company has been registered with a capital of £6000, in £1 shares, to enter into an agreement for the acquisition of gas manufactories hitherto carried on by Messrs. L. Chapman and Co., at No. 4, Sheffield Street, London, and for the development and extension thereof. The Wells Limelight Company, Limited, with a capital of £1200, in £1 shares, is to acquire the business now carried on by Messrs. J. Wells and Co., at Earlsfield. The Electric Light Insurance and Maintenance Company, Limited, with a capital of £10,000, in £1 shares, has been formed to enter into contracts and issue policies of insurance for the maintenance of all electrical appliances, and to carry out contracts for electric lighting.

## NEWCASTLE AND GATESHEAD GAS COMPANY.

The Annual General Meeting of this Company was held last Wednesday—Mr. W. B. WILKINSON in the chair.

The CHAIRMAN, in moving the adoption of the report, stated that the results of the year's working were, as usual, of a satisfactory character, with the exception of sulphate of ammonia; the reduction in revenue from this source being about £5000. The price had never before been so low. The revenue from coke had been satisfactory. They had also had a fairly good year for tar; and the revenue therefrom had slightly increased. The revenue from gas, including public lighting, was £13,473 more than in the preceding year. This increase was from augmented production and sale, and not from an advance in price. The Directors expected an increase in quantity of about 4 per cent.; but it had been a little over 10 per cent. The quality and pressure over the year had been considerably above the parliamentary standard. The quantity of gas produced had exceeded that made in the previous year by about 200 million cubic feet. They found it absolutely necessary to press forward extensions at the Redheugh works, and to secure land for still further extensions in years to come at St. Anthony's, near the extreme boundaries of the borough eastward. A Bill for this purpose had been promoted in Parliament, the details of which would be explained at the special meeting to be held subsequently. The whole of the authorized capital—£750,000—had been paid up, and nearly all expended. A sum of £22,000 had been spent on extensions during 1895; and a much larger amount would be required in the present year. The revenue account showed a balance of profit of £68,000. It was, perhaps, worth while to point out that a considerable part of this profit was not derived from the sale of gas and residuals, but was the result of having about £135,000 of premium capital, on which no dividend could be paid. If the Company had not had this, the like amount of dividend-paying capital would have had to be provided; and instead of a 9¾ per cent. dividend, not more than 8 per cent. could have been paid. The accumulations of premiums on sales of stock, therefore, had been, and would continue to be, of great advantage to the 30,000 customers of the Company (who, no doubt, were ratepayers), and in a much less degree to the shareholders. The sliding-scale in their case had answered admirably; but the initial price was fixed, contrary to the wish of the Company, at 2s. 9d., whereas it ought not to have been less than 3s. Had this been done, the shareholders would have before this been receiving a dividend equal to that paid by most other gas companies. They happened, however, not to be very much behind; and taking into account the very low price of their gas, and the great decrease in the value of one of the chief residual products, the financial results of the year's work might be said to be eminently satisfactory.

The report was adopted; and a dividend of £4 17s. 6d. per cent. was declared for the half year ending Dec. 31.

A Special Meeting was then held to consider the Bill which the Company are promoting.

Mr. COOPER (the Solicitor to the Company) explained the provisions of the Bill, by which it is proposed to raise further capital to the extent of £500,000 by shares, with borrowing powers to the extent of £125,000. He said the first object of the Bill was to acquire land at St. Anthony's, and close to Walker. The total area was 80 acres. The Company sought authority, in addition to buying land, to erect the usual works for the manufacture of gas and residuals. They also asked for power to lay pipes within a certain part of the district of the Walker Gas Company, not for the purpose of supplying gas in the district in competition with the Company, but for conveying gas from any works which might happen to be erected by the Newcastle Company within the Walker district into the Newcastle Company's own mains within their own area. The Bill contained the usual provisions limiting to three years the time within which the compulsory powers might be exercised. It also sought powers to enable the Company to make agreements with any other gas company or with any local authority for the supply in bulk of gas. These powers would be subject to the general condition that no gas must be supplied within the parliamentary district of any other competing gas company without the consent of that company. The dividend on the new capital would be 5 or 7 per cent., according to whether it was raised as preference or ordinary; the standard price being 2s. 9d., with the sliding-scale.

Mr. J. D. SCOTT moved that the Bill be approved.

Mr. J. E. DAVIDSON seconded the motion; and it was carried.

The proceedings then terminated.

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## CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Charles M. Ohren) read the advertisement convening the meeting; and the Directors' report and the accounts for the six months ending Dec. 31, of which a summary appeared in the "JOURNAL" last week, were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Directors gave in the former a very fair account and *résumé* of the position of the Company, and, if the accounts were referred to, it would be found that they were also very full and complete. So that anyone who took an interest in the business could, by the report and accounts, form a good idea of its condition and prospects. In the second paragraph of the report, reference was made to the reduction in the price of the gas. The Directors felt they were perfectly justified in reducing the price by 1d. from Midsummer last, following the policy that had been adopted by the Company from almost time immemorial, of always lowering the price by small amounts as soon as they found themselves with a sufficient surplus to warrant it. Though they had anticipated a certain decline in the receipts from the residual products, they certainly did not expect the falling off would be so great as it had proved to be. For instance, comparing the accounts with those for the December half of 1894, he found that the recipts for coke were actually 1s. 6d. per ton of coal less—that was, for every ton of

coal they used in 1894, they received from coke 6s. 7½d., while last half year they only realized 5s. 1d., which was rather more than 1s. 6d. difference. This was a very serious and unexpected drop; and, unfortunately, it had told to that extent on their accounts. They had, however, done better with tar. In the corresponding half year, they only received for tar 11d. per ton of coal, as against 1s. 3d. in the past half year. On the other hand, sulphate of ammonia had gone down. In the second half of 1894, they obtained for sulphate an average of 1s. 2½d. per ton of coal; but last half year, it only worked out at 10d. Therefore, taking the products altogether, they realized 8s. 9½d. per ton of coal for them in 1894, and only 7s. 2¾d. in 1895. However, they purchased coal at 1s. per ton cheaper. So that, taking one thing with another, although they lost on products, they gained on coal, which brought out the net cost of coal to a fraction above 5s. 8d. last half year, as against 5s. 1d. in the corresponding six months. He did not want to trouble and burden the proprietors with all these figures; but he and his colleagues thought it necessary that an explanation should be given to show how it was that there was a deficiency of something like £1438 in the amount required to pay the usual dividend. It might be said: "Why did you reduce the price of gas, because, if you had kept up the price, you would have had a balance in hand; but having reduced the price, you are this sum short?" The whole of it was accounted for in the extra drop in the products. For instance, sulphate was selling two years ago at £13 15s. per ton; while, only at the last Board meeting, they sold 100 tons at £8 6s. 6d. Sulphate was now mending a little. But there were large stocks of it in London; and until they were disposed of, there was not much probability of the market improving materially. But the deficiency in their profit was not a matter that need distress the proprietors in any way. The business of the Company was growing, especially in regard to automatic meters. They had had, compared with the corresponding half of 1894, an increase of 4½ per cent. in the quantity of gas sold; but they did not expect an increase in the present half year, because, in the June half of 1895, they had that extraordinary frost. Still they had good prospects of coming out pretty well in the current half year. The deficiency of £1438 would be taken from the undivided profit. They had a surplus of £5349 brought into the half year; and they would carry forward £3994 to the next accounts. But beyond this they had a very large reserve fund. It amounted to £40,187, or very nearly sufficient, adding the £4000 undivided profits, for one-and-a-half years' dividends. He therefore thought the Directors did perfectly right in reducing the price of gas, because, it should be remembered, that it was by a low price that they improved the stability of the Company, and defeated competition. The Directors therefore felt that it was not merely their duty, but it was positively advantageous to the Company, to sell gas at as low a price as possible. They had now to make their new contracts for coal; and the Board believed they would be able to enter into them on fair terms. Proceeding to refer to the quantity of gas made per ton of coal carbonized, the Chairman said that those who looked at the accounts would find that they appeared to have made gas at the rate of 10,369 cubic feet per ton. Well, that was a fallacy. Then they appeared to have unaccounted-for gas amounting to 9·4 per cent. That was equally wrong; and the explanation he had to give of this was that the gas made was measured at the station meter at a temperature considerably in excess of the temperature of the air. In the process of purifying, the gas was warmed up to some extent—the purifying process went on better with the gas a little warm than if it was cold. The gas thus passed from the purifiers to the station meter in an expanded condition; and, consequently, he believed the quantity measured per ton of coal used was really about 300 cubic feet too much. Therefore, instead of having made 10,369 cubic feet per ton, or a total of 495,349,000 cubic feet in the half year, if they took off 300 cubic feet per ton they would be nearer the mark; and that would bring the unaccounted-for gas to the reasonable amount of about 6 per cent. This had been a disputed point for many years among gas people; and it had given rise to a great deal of discussion on the subject of leakage. But they did not seem even now to have arrived at a proper understanding of it. Some engineers took the temperature of the gas at the station meter, and corrected its volume to what it would be at 60° Fahr.; and that was taken as the quantity of gas made. Now to do this was altogether fallacious. The average temperature of the atmosphere in London was not 60°. He had asked one of the greatest authorities in the world on this subject (his friend, Mr. Glaisher) what was the average temperature in London, and he said 52°, the same as the latitude of London; in fact, he said the temperature went very much with the latitude in this country—that was, inversely, for each extra degree of latitude there was 1° less temperature. That was a piece of information worth knowing. Now the average temperature of the air in London being 52°, it was altogether wrong to measure the gas and calculate the gas as if it were at 60°, because, when it came to the consumers' meters, it was measured at about the temperature of the air. It was a mistake to take the average temperature whatever it might be, because the quantity of gas made throughout the year was not a uniform quantity. In June they only made a third of what they did in December; and that would altogether put out the average. Therefore, he thought that the way they were doing it at another works was the best—that the temperature of the gas should be taken at the station meter every three hours, the temperature of the air also taken at the same place every three hours, and the volume of the gas corrected daily (he would not say exactly) to the temperature of the air. He thought it would be safer to put it a little above it, because he believed the gas measured at the consumers' meters was measured at a few degrees higher than the average temperature of the day. If that were done week by week, they would get a fairly accurate account of the gas made; and then they could deduce fairly the quantity of gas unaccounted for. Turning to the fourth paragraph in the report, he said it related to the question of the dividend. They were entitled, at the present price of gas, to 5⅜ per cent. According to the sliding-scale, with their 5 per cent. capital, they were allowed to increase the dividend 2s. 6d., or ⅛ per cent., for every reduction of 1d. they made in the price of gas. The price was now 3d. below the standard; and therefore the proprietors were entitled to an extra dividend of ⅜ per cent. It had been agreed that it was not worth while dividing such small fractions as eighths; and they agreed that they would add it to the reserve fund. This fund stood at a good figure already; and he thought it was high enough. As, on the present occasion, they had not earned the 5¼d. per cent., the Directors were certainly not in a position to recommend the payment of more than that amount. At present they were unanimously of opinion that it would be well to adhere to the idea set forth last year, that fractions of less than ¼ per cent. should not be paid. However, they might put by the ⅛ per cent. until the end of the year, when it would amount to ¼ per cent. That was merely his idea; and he did not mention it with any authority. At any rate, the Directors were not prepared to recommend more than 5¼ per cent. on this occasion.

The DEPUTY-CHAIRMAN (Mr. Frederic Lane Linging) seconded the motion.

Mr. E. T. E. BESLEY, Q.C., having made some remarks with reference to the reserve fund and the price of gas, remarked that he noticed the coke made in the half year, taking out the amount used in manufacture, appeared to be equal to 22,554 tons. During the last few months, there had been some difficulty in getting rid of coke in the Metropolis; and he should like to know whether the proprietors might assume that the Directors had the advantage of selling a good proportion of the 22,554 tons to small consumers or the general public, or whether they had a contract under which they disposed of the coke. He also inquired the price obtained.

The CHAIRMAN said, in regard to the reserve fund, he might mention that it was useful and necessary to tide over temporary and unexpected losses. He was of opinion that, if there was a serious rise in the cost of coal (only twice had there been a really serious rise in his experience), which generally lasted two or three years, it would then be well to raise the price of gas early. The public quite recognized the necessity of doing so; and if it was raised to a moderate extent early, it enabled them to tide over those periods in a more satisfactory manner than by dipping too largely into the reserve fund, because this fund, once pulled down, could not be built up again except by foregoing dividends. As to coke, their system was this: They had a certain yard price—a number of people fetched coke from the yard, and others sent orders for deliveries. The present yard price was 7d. per cwt., 7s. per chaldron, or 11s. 8d. per ton. Being on the railway, they adopted some years ago a uniform system of selling coke by rail. They allowed a rebate of 1d. per cwt. off the coke sold in that way; so that when coke was 7d. in the yard, it would be 6d. by rail. Upon every change in price, Mr. Ohren sent a circular round to their customers announcing the fact; and by these various means, they were able to keep down the stock of coke. They obtained the market price for the coke; they did not ask for more; they did not want to get the better of the customers; and they did not wish to speculate.

The motion was carried unanimously.

The CHAIRMAN then proposed the declaration of dividends at the following rates per annum: 5 per cent. on the preference stock, and 5¼ per cent. on the ordinary stock, less income-tax; and that the odd ⅛ per cent., amounting to £334, be carried to the reserve fund.

Dr. FREDERICK HETLEY seconded the proposition, which was at once agreed to.

The CHAIRMAN said the effect of carrying the ⅛ per cent. to the reserve fund would be to transfer it from the undivided balance. This was the only way they could increase the fund; and so they thought it well to do so. He proceeded to move the re-election of his two retiring colleagues—Messrs. F. L. Linging and C. Lea Wilson, and remarked, with regard to the former, that he had been a Director of the Company for something like 35 years.

Mr. FORTESQUE FLANNERY, M.P., in seconding the motion, spoke of the interest with which he had listened to the remarks of the Chairman upon the question of the effect of temperature on the measurement of gas.

The motion was unanimously passed.

The retiring Auditor (Mr. A. G. Hounsham) was reappointed, on the motion of Mr. BESLEY, seconded by Mr. WESTCOTT.

Mr. ALFRED LASS, in moving a vote of thanks to the Chairman and Directors, said he should like to say a word or two with reference to the Chairman's remarks respecting the question of temperature. He (the speaker) had been very much perplexed at times in connection with this matter. In some cases, they had merely taken the registration of the station meter. In other instances the quantity of the gas made was reduced to 60° Fahr.; and the end of it was that the unaccounted-for gas practically stood for nothing. He was glad the Chairman had brought this matter forward; and he (Mr. Lass) should endeavour as far as he could, in connection with the gas companies with which he was associated, to get the principle carried out.

Mr. WESTCOTT seconded the motion, which was heartily agreed to.

The CHAIRMAN having responded, spoke highly of the services of all the officers—from the Engineer (Mr. Charles Gandon) and the Secretary (Mr. Ohren) down to the foremen; and he proposed a vote of thanks to them and to the workmen. Alluding to the absence of Mr. Gandon, he said that he had had an attack of influenza; and his doctor had told him that, if he came out prematurely, it might have a very serious effect on him. In the course of remarks regarding the workmen, the Chairman mentioned that some of them had been in the Company's service for many years, and were interested in its prosperity. About two years ago, the Directors started a profit-sharing system, and the men received a bonus under the sliding-scale principle. For every penny reduction made in the price of gas below 3s., they obtained 1 per cent. on their salaries and wages. Half of their bonus was invested in the Company's stock, and the other half was optional—they could either withdraw or leave it in the Company's hands at 4 per cent. interest. He was pleased to find that about one-third of them took the latter course; and the money already amounted to a very considerable sum.

Mr. LINGING seconded the motion, which was carried unanimously.

The SECRETARY having responded, the proceedings terminated.

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**Portland Water Supply.**—The Portland District Council have lately resolved to enter upon a scheme of water supply, which, in the aggregate will cost something like £27,000.

## BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. JAMES GLAISHER, F.R.S., in the chair.

The SECRETARY (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting; and the report and accounts, to which allusion was made last week, were then submitted.

The CHAIRMAN said there was very little for him to speak about on this occasion; but there were a few points in the accounts to which he should like to refer. Looking at the capital account, it would be seen that they had now £195,000 of capital stock paid up; £42,000 had been borrowed; and they had received a premium of £4357, which was obtained by selling £10,000 of "D" gas stock. These amounts made a total of £241,357, of which £96,109 had been devoted to the gas department, and £137,750 to the water undertaking—leaving £7497 in hand. Of the "D" capital gas stock, there remained £48,200 yet to be issued; and this would have to be sold by auction. Of the water capital (which could be distributed *pro ratâ* among the shareholders) they had £106,000 altogether to be issued. Therefore they had capital that could be called up when needed to the amount of £155,000, and there were also the borrowing powers dependent upon it. With respect to the working of the gas undertaking, it would be seen that they had spent £295 more on coal; and they had made an additional 2 million cubic feet of gas. The total amount spent under manufacture had only increased by £312 compared with the corresponding period of last year; distribution had cost £30 less; but rents, rates, and taxes came to £426, which was £98 more. The total expenditure was £6535; while in the December half of 1894, it was £6194—showing an increase of £331, which was made up entirely by the additional outlay on coal and rates and taxes. The private and public lighting had increased by about £76. But with regard to the residuals, both coke and sulphate of ammonia were "out of joint" at present; and their receipts under this head had been £168 less. The total revenue had been £9358, as against £9438; so that there had been a deficiency of £80 as compared with the corresponding period of 1894. When, however, it was considered that since then the price of gas had been reduced by 2d. per 1000 cubic feet, it showed that in future they would realize the same profit as before, because the revenue was moving up. In the half year, for instance, 1¾ million cubic feet more gas had been sold. The profit on the gas undertaking was £2823, as compared with £3244; being £421 less, which was accounted for by the variations he had already referred to. Viewed altogether it showed that the gas part of their business was increasing satisfactorily. Turning to the water accounts, the rates and taxes amounted to £693; being £141 more. The receipts for water-rents showed an increase of £534; indicating how steadily the business was increasing half year by half year. The total revenue from water was £9187, as against £8554 in the corresponding half of 1894; and the profit was £5716, which was an increase of £291. The profits enabled the Directors to pay the usual dividends without touching upon the reserve, and with a few pounds to the good. Referring to the supply, he said that their three wells were so close together that they could not carry on work in one without interfering with the water in the other, and making it chalky, which gave rise to complaints. With the view of obtaining an additional supply, they sunk a trial bore-hole at Potters Bar, which the Board considered held out high promise of giving them the water they required. A sample was submitted to Dr. Frankland for analysis. He reported that the sample was very cloudy from suspended particles of chalk; but, after being allowed to stand for a time, it became perfectly clear and bright. The water possessed an extremely high degree of organic purity; and was of most excellent quality for dietetic purposes, and well suited for a public supply. Considering its source, its hardness was moderate. Upon receiving this report, the Directors proceeded to enter into contracts with Messrs. Docwra. The excavation for the permanent well was commenced on July 10 last, and continued to Oct. 3, when the depth to which it was sunk and lined with brickwork was 99 feet from the surface—the internal diameter of the well being 11 ft. 3 in. From the depth mentioned, cast-iron cylinders had been sunk through the various strata firmly into the chalk, so as to exclude all water above the chalk. This was accomplished a few days since; and the Contractors were now preparing the foundations for the pumping machinery. It was proposed to sink the well 250 feet from the surface, and then to drive adits horizontally. At the next meeting, he hoped to be able to announce that good progress had been made. He concluded by moving the adoption of the report and accounts.

Mr. C. HORSLEY, J.P., seconded the motion, which was carried unanimously.

On the proposition of the CHAIRMAN, seconded by Mr. C. E. CECIL, the retiring Directors (Messrs. C. Horsley and I. A. Crookenden) were re-elected; and on the motion of Mr. WESTCOTT, seconded by Mr. J. L. CHAPMAN, the retiring Auditor (Mr. F. Lennard) was re-appointed.

The services of the officials—Messrs. Lass, Martin, and Wright—were then acknowledged; and subsequently a vote of thanks was passed to the Chairman and Directors—the mover (Mr. Chapman) stating that Mr. Glaisher had recently been indisposed; and it was only at some considerable inconvenience to himself that he was there that day to meet the shareholders.

The proceedings then terminated.

## CAGLIARI GAS AND WATER COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, 3, Lothbury, E.C.—Mr. JOHN AIRD, M.P., in the chair.

The SECRETARY (Mr. W. B. Peat) read the notice convening the meeting; and the annual report and accounts, to which reference was made last week, were taken as read.

The CHAIRMAN, in submitting the report and accounts for adoption, remarked that the Directors considered the latter very satisfactory; and they hoped the shareholders were also of that opinion. Regarding the water supply, his remarks would be necessarily few, because it had remained in the same condition as before, and that condition was a perfectly favourable one. The works had been maintained in complete order; the supply had been all that was desired; and he believed that, while it had proved entirely satisfactory for the shareholders, it had fulfilled the requirements of the city and the district around. The only point upon which he wished to say a few words in connection with the water supply had reference to negotiations which had been going on during the past year to purchase from certain proprietors the supply to the town of Pauli. As these negotiations were still in progress, it would be undesirable to enter into them to the extent of specifying the details and the conditions under which they proposed to make this absorption. It was not by any means a large matter; but nevertheless the Directors had thought it right to take this action, believing it would benefit the district of Pauli, and, at the same time, bring the business more completely into the Company's own hands. It had, however, become a question of terms; and unless the terms could be arranged in a manner perfectly satisfactory in the interests of the Company, they would simply have to leave Pauli, and wait for the opportunity of doing it some service. He proceeded to mention that the Directors had thought it desirable to purchase a building in Cagliari for general offices for both the water and the gas supply. The amount they had appropriated for this purpose was only about £1200, which sum had been taken from the reserve fund. Dealing generally with the accounts, he was glad to say there had been a great improvement; and they came out very well indeed. The profit on the year's working, after making provision for the sinking fund, and charging the revenue with a portion of the expenditure for new mains and services, amounted to £14,400, exceeding the return for 1894 by £1700, which the Directors regarded as exceedingly creditable—especially to those who had managed their affairs in Cagliari. The items which principally contributed to this result were cheap coal, low freights, relative low rate of exchange, and a very substantial increase in the gas-rental. Respecting the gas receipts, they showed an advance in the year of £848 compared with 1894; while the gas expenditure had only been raised by £37. It was very gratifying to know that, although they had to reduce the price of coke and to send large quantities on to the Continent, the products from the gas-works had realized during the year 80 per cent. of the cost of the coal. The coal carbonized by the Company had only cost £18 more than in 1894, although they had received an additional £833 for gas. The increase in the profit had been assisted very materially by the benefit they had gained in the rate of exchange. This was lower than in 1894, so that the loss under that head was £911 less. The Directors hoped and believed, from what their friend Mr. Simmelkjör advised them as to the financial condition of Italy, that there would be still greater improvement in this respect in the future. At the last meeting, he referred to a communication which had been made to them by the Prefect and the Syndic with a view to introducing the electric light into Cagliari for special purposes—more particularly for lighting the Opera House. The Directors believed the matter would be best dealt with by appointing a Committee consisting of three of their number—Mr. J. Orwell Phillips, Mr. F. W. Blunt, and Mr. Simmelkjör. As a result, they were advised that their concession absolutely put a stop to any other system of lighting being introduced into Cagliari during the term of the concession; and this gave the Company a strong position. But it was a position which the Directors thought, in the interests of the Company—having worked such a number of years so cordially with the authorities—it would be undesirable to take advantage of; and therefore, through the medium of Mr. Simmelkjör, they entered into communication with the authorities on the point. The outcome, he was sure the shareholders would be glad to know, was that, while the Company had been able to give effect to the wishes of the city to have the Opera House lighted, they had done so under an arrangement which was fairly favourable to themselves, and prevented any possible conflict arising in reference to this question. The Chairman read an extract on the subject from a report by Mr. Simmelkjör, from which it appeared that two gas-engines had been installed for generating the electricity; that the Company had now a contract for electric lighting with the Municipality for thirteen years (to the end of the gas concession); and that the lighting was giving universal satisfaction. Continuing, he remarked that the Directors thought that, if they could further the views of the authorities, without any detriment to the Company—rather to the Company's benefit—they would be fulfilling the wishes of the shareholders in keeping on the best of terms with the authorities, and arranging for this matter to be carried out. The Company had been associated with the public bodies of Cagliari for 28 years. But from the first to the last, they had not had any serious differences with them; and this had added greatly to the prosperity of the concern. As he believed the shareholders were aware, the Directors thought it desirable some two or three years ago to make certain alterations in the fitting arrangements, and to keep them well in their own hands, so as to be assured, in the interests of the consumers as well as their own, that the fittings were maintained in proper order. This had been appreciated by the inhabitants; and he was certain it had contributed to the prosperous working of the gas supply during the past year.

Sir FREDERICK WIGAN seconded the motion.

Mr. PAYNE said he noticed that the sinking fund was given on the creditor side of the balance-sheet as £14,435, and the reserve fund as £11,145; but the investments of the sinking fund were only £13,701, and of the reserve fund £9877. He should like an explanation of this, and also information as to the income from these respective funds during the year.

The SECRETARY said the uninvested balance of the two funds was part of the accretions of the year to the funds, which were not yet invested, but which would be invested during the current year. There was always a little uninvested balance, because they did not make up the reserve fund until the end of the year; and they did not receive the dividends until then. Consequently, they could not have it simultaneously invested. For instance, they transferred the sum of £1000 to the reserve fund out of the profit of the year. They did not do this until the end of January, so that it was included in the difference between the reserve fund of £11,145, and the investment of £9877. The interest

on the sinking fund was about £520; and the interest on the reserve was £317, which amounts were transferred to the respective funds.

The CHAIRMAN also mentioned that the investments gave them an average interest of 3¾ per cent. They were entered in the accounts at their purchase price; but they were worth more, if valued at that day's quotations.

The motion was unanimously carried.

The CHAIRMAN then proposed the confirmation of the interim dividend at the rate of 6 per cent. per annum, and the declaration of a dividend at the rate of 8 per cent. per annum for the half year ending Dec. 31—making 7 per cent. for the year—and also a bonus of 5s. per share.

Mr. J. O. PHILLIPS seconded the proposition, which was agreed to.

The retiring Directors (Messrs. Aird and Blunt) and the Auditors (Messrs. H. Bishop and R. S. Robb) were re-elected.

The services of the Directors and officers having been acknowledged, the proceedings terminated.

## PARA GAS COMPANY, LIMITED.

### The History of the Company's Difficulties—A Re-construction Scheme.

The Adjourned General Meeting of this Company was held last Thursday, at the London Offices, 16, St. Helen's Place, E.C.—Mr. ULICK J. BURKE in the chair. The proceedings were commenced at a meeting on the 30th ult.; but they had to be adjourned, owing to the non-receipt of the accounts from Pará—the only business transacted being the re-election of the retiring Directors and Auditors.

The SECRETARY (Mr. T. S. Borradaile) read the notice convening the meeting. The report and accounts were then submitted; and they showed that the result of the working during the half year ending Sept. 30 last was a profit of £1345.

The CHAIRMAN, in moving the adoption of the report and accounts, remarked that the latter were almost identical with those presented in former half years. There had been a little rise in the receipts owing to the rate of exchange. The result in the half year ending September, 1894, on the debit side of the revenue account, was £14,487, as against £14,611 now. The totals were therefore very nearly alike; and, in going through the other items, it would be seen there was but little discrepancy. Consequently he did not propose to take up time by dwelling on them. What they were now proposing to do in the way of re-constructing the Company was so influenced by their past history that he would like to say a few words in that respect. When first he was appointed a member of the Board a few years since, he felt at once that the concern was much handicapped by having only a brief term of years to run. It was exceedingly short-sighted policy to start a gas company with only a few years'—thirty in their case—concession. It stood to reason that the plant would become worn out; and it would be a great responsibility to spend further capital on that account with an expiring concession. The Directors found that the best thing they could do was to prepare for a renewal of their contract if possible; and they framed a scheme which, in all probability, they might have worked through in 1891. But the revolution then broke out in Brazil; and there was a general disturbance of all relations, and, of course, of all the preparations they had made. One immediate result was that, instead of there being as hitherto a Government, as it was called, the affairs were handed over to a Municipality; and it affected their own Company in this way: That whereas they were entitled to make contracts with the Government of Brazil or Pará, they were not entitled to do so with the Municipality. The Directors then suggested that, if a scheme could be hit upon which was satisfactory to the Municipality and to themselves, they would submit it to the shareholders for their approval. These negotiations were proceeding when another revolution broke out. One consequence was that exchange fell to a very low ebb indeed; and it had never since recovered. Their position was analogous to what that of a gas company in Europe would be if a sovereign only represented 7s. 6d.; and the shareholders would be able to imagine what the effect of exchange was upon the difficulties with which the Directors had to contend. So matters went on, until it became a question whether the only way of renewing the contract was not by tender. One difficulty in renewing by tender was that the terms were such as they could not conscientiously recommend the shareholders to accept. While the negotiations had been proceeding, the electric lighting people had had a tender granted to them. Therefore, the Gas Company were in this position: Their contract was coming to an end—strictly speaking, it came to an end in 1892; but it was extended from year to year. Now that it had terminated, and the public lighting had ceased, there were only two courses open to them—either to wind up the Company and sell the plant, or to continue as best they could with the private lighting. He was bound to say that, on the first blush, the position did not seem very hopeful; and there was a disposition to think that the best plan would be to wind up. But they had been gradually reassured from Pará as to the prospects of private lighting. If they wound up the concern, the effect would be that they would have for sale mains that had been underground, and plant that had been in use, for thirty years. The decision of the Directors was, after great consideration, to recommend the shareholders to re-construct the Company. From what he had heard, he did not think the electric light was likely to make much of a sensation in Pará; but to compete with it, they must spend some money in putting the mains and plant in as efficient a state as they would be justified in doing. Having referred to the efforts which were being made by the Manager to push the use of cooking-stoves and the incandescent light, the Chairman said the shareholders might rest assured that the Directors had no intention to run them into any reckless expenditure of capital. What they proposed to do was, first of all, to take the money they had realized from the sale of land, and to make it go as far as possible. If, after that, they called up capital, it would only be done because it was necessary; and the matter would be submitted to the shareholders before they were committed to any heavy issue of capital. It had been proposed to him that it might be desirable, before spending money on the works, to have an independent report on their state, and as to what was necessary in the way of improvements; but he did not think they would get a good man to visit Pará unless he was going out for other purposes. In his opinion, too, they would not be able to obtain the services of such a man under £600 or £700; and he thought they would be ill-advised in spending so large a sum now, as it would go a long way in helping them in their troubles. As to the re-construction of the Company, of course, they could not pretend to say it was going to be a great success; but it really seemed to be the best way they could conceive out of the difficulty. Their Manager seemed to be full of "go" and hope; and he (the Chairman) considered they had a very fair chance of doing something for the shareholders.

General TUPPER seconded the motion.

Mr. E. T. LAMBERT, having criticized certain items in the accounts, remarked, with regard to the question of a report by an expert upon the works, that he regarded this as a most important point. They had lost the whole of the public lighting; and they were reduced, as far as he could make out, to a revenue amounting to about £5000 a year from the private lighting. Then, the electric light having started, it was probable that it would take away some of the Company's principal consumers. He should like to know how many years' concession had been granted for the electric light. [The CHAIRMAN: 25.] In his opinion, the Directors would have been far better advised to have wound up the Company; for he could not see how they would be able to pay a dividend.

Mr. C. E. BLUNDELL inquired the relative prices of electric and gas lighting in Pará. Unless, he remarked, they could compete with the electric supply in point of price, it would have been better if they had wound up the concern. He also advocated the sending out of an expert to report on the works before spending money upon them.

The CHAIRMAN, replying, stated that the gas supply was relatively 50 per cent. cheaper than the charge for electricity for private lighting. Regarding the plant, they well knew its condition.

Mr. A. H. HENRY said he should like to point out, with regard to the public lighting, that the profit they had derived from it had been gradually diminishing, because they could not get an increased price for the gas. If they had put the mains in efficient repair, it would not have increased the sale, as, unfortunately, the price of the private supply was also at a fixed figure—half payable in gold, and half in local currency. Since the good commercial times of the Brazilian empire, they had lost something like 4s. per 1000 cubic feet on the private consumption. Now their prospects were infinitely better, because they were perfectly free to fix their own charge. They had every reason to believe they would be bound to a gold price; but they would fix it at an amount lower than the electric supply for the same illuminating power. They were now negotiating for the sole privilege of supplying gas for private lighting; and this would put them in a good position for taking up the public lighting should the electric light fail.

The motion was carried unanimously.

This concluded the proceedings of the ordinary meeting; and a private extraordinary meeting was subsequently held for the purpose of further considering the re-construction scheme.

## PROVINCIAL GAS AND WATER COMPANIES.

### Gas Companies.

The annual general meeting of the Barnsley Gas Company was held on Monday last week, under the presidency of Mr. E. G. Lancaster. The Secretary and Manager (Mr. W. W. Hutchinson) read the statement of accounts, showing that in the past year there had been a decrease of £208 in the cost of gas manufacture, repairs, and maintenance—the total expenditure being £18,003, as compared with £18,012 in 1894. The total receipts were £26,395, as against £25,541—an increase of £854. The quantity of gas sold was 116,976,700 cubic feet, as compared with 112,114,000 cubic feet—a rise of 4,862,700 cubic feet; the larger portion of it taking place in the first three months of the year. The Chairman, in moving the adoption of the report and accounts, remarked that it was thirteen years—a long and weary time—since the Directors had had the pleasure of producing such a balance-sheet as the one now presented. He need not go through the various items of expenditure which had prevented them paying their maximum dividends in previous years. The expenditure in 1895 was practically identical with that of 1894—it was a few pounds below it; but the result of the year's working had enabled them to produce and sell 5 million cubic feet more gas. This represented £750; and it was really this which had enabled them to say the shareholders should receive the dividends they had been entitled to for a long time. The steady annual growth of the consumption was, in the opinion of the Directors, a most hopeful feature about the Company. From 1875 to 1885, the annual increase was at the rate of 3 per cent.; from 1885 to 1895, the increase continued, only it was at the rate of 4 per cent.; and in 1895, the rise was very nearly 5 per cent. They must look to this increase to keep up the maximum dividends. The Directors last year made a half promise to give the consumers some advantage in the shape of discounts. This they would now do. [The Chairman explained the proposed arrangement.] Relief would also be afforded to the users of gas-engines, who would be charged a minimum rate of 2s. 10d. per 1000 cubic feet. The most important concession was a discount of 5 per cent. to every consumer who paid his account within 21 days of the date of delivery. This represented 2d. per 1000 cubic feet. These three allowances would amount to £1500; and the wisdom of making them might be questioned. But the Directors were so anxious that the public should receive a share in the Company's returning prosperity, that they had determined to risk it. Mr. S. J. Cooper seconded the motion; and it was carried. A vote of thanks having been accorded to the Chairman, Directors, and Manager, Mr. Lancaster returned thanks. He said the Board worked very amicably; while so far as Mr. Hutchinson was concerned, the shareholders were aware it had been his first year as sole Manager. He (the Chairman) could not help expressing a feeling of regret that the late Mr. Hutchinson should have been taken away

just when blue sky seemed to be appearing for them. If he had been spared another year or two, it would have been the height of his ambition to see them landed once more back in their full dividends. They had his son's earnest exertions to do this. He did not like to say all he really felt about the time and thought Mr. Hutchinson had given to their service. But it had resulted in full dividends; and he looked to him to keep it up in the future.

The Directors of the Bath Gas Company state, in the report to be presented to the proprietors next Friday, that the accounts for the six months ending Dec. 31 are satisfactory in respect of the gas-rental, which shows an increase over the corresponding period of the previous year, but not so as regards the account for residual products; coke exhibiting a slight decrease, and sulphate of ammonia a very decided falling off, owing to the depressed state of the market. The receipts from the sale of gas amounted to £25,615; the rental of meters, stoves, and fittings, to £1114; residuals produced £4612; and the total revenue was £31,689. The expenditure was unusually heavy, caused by a large outlay for renewing and remodelling various parts of the works. These changes were deemed necessary to prevent a recurrence of the inconvenience caused by the flood in November, 1894; and a considerable saving in working is anticipated therefrom. The manufacture of gas cost £20,973 (£12,707 being for coal and oil); its distribution, £2617; management came to £1439; and the total expenses were £26,794—leaving £4895 to go to the profit and loss account. The amount available for division is £10,768; and the Directors recommend the declaration of the maximum dividends. With regard to the working, 19,233 tons of coal and 46,845 gallons of oil were used in the manufacture of gas; the residuals produced being: Coke, 12,481 tons; breeze, 1163 tons; tar, 967 tons; and ammoniacal liquor, 538,000 gallons—the sulphate made being 165 tons.

The half-yearly meeting of the Bristol Gas Company was held last Friday—Alderman J. W. S. Dix in the chair. In moving the adoption of the report, which was noticed in the "JOURNAL" last week, the Chairman first referred with regret to the loss sustained by the Board in the death of two of the Directors—Mr. S. Jones and Mr. J. A. Jones—who had been with them for many years. In the place of Mr. S. Jones they had selected Mr. Fenwick Richards. So far as the accounts were concerned, they did not call for much remark. They had been successful with their cooking-stoves, the number of which now in use was 3257—showing an increase of 405. Mr. Phillips (the Secretary) had reminded him that about one-third of the consumers had them; and they found that the more they were used, the more they were appreciated. As far as their "slot" meters were concerned, they made progress; and he looked forward to a great future for these meters. They had not had the best year for gas companies. The weather was warm; and in very cold weather people required more heat. Moreover, the price of residual products had gone down. Mr. G. K. Stothert seconded the motion; and it was carried. Alderman Dix and Mr. A. C. Pass were re-elected Directors; and Mr. J. H. Lockley was chosen to fill the vacancy caused by the death of Mr. J. A. Jones. The salary of the Secretary was increased by £100 per annum; and the dividend recommended (at the rate of 5 per cent. per annum) was adopted.

The annual meeting of the Carmarthen Gas Company took place on Monday last week—Mr. C. W. Jones presiding. The Directors' report, as submitted by him, showed that the quantity of gas sold during the past year was 15,959,000 cubic feet, against 15,261,000 feet for the year 1894; being an increase of 698,000 feet. The coal carbonized was 1943 tons; as compared with 1904 tons. The profit on the working, as shown in the revenue account, was £1134. After paying £154 on mortgage and debenture stocks, there remained a balance of £979. A dividend of 7½ per cent. on the ordinary shares, and of 7 per cent. on the new ordinary shares, required £978. The Directors recommended that dividends at the above rates should be declared. The Chairman proposed that the statement of accounts be adopted and the report of the Directors received. This was agreed to; and the dividends recommended were declared. The invaluable services of Mr. B. A. Lewis, the Manager and Secretary, were duly acknowledged.

In the report to be presented at the meeting of the Cork Gas Consumers' Company to-morrow, the Directors refer to the severe loss sustained by the Company in the death of Mr. Denny Lane, who had been the Secretary for nearly forty years. His great knowledge of general subjects, and particularly his brilliant scientific attainments, were, they remark, always devoted to the shareholders' interests. The accounts for the half year ending December, 1895, show a decrease in the amounts of both private and public rental, when compared with the corresponding period of 1894. This is accounted for by the reduction in price which commenced in the beginning of last year, and not to any falling off in consumption, which has, on the contrary, increased. The receipts from residuals are less, owing to the low prices obtained. The expenditure on labour and wear and tear shows an increase over the general average, in consequence of alterations and renewals of some of the mains, undertaken to improve the supply in certain districts. After crediting £400 to depreciation, the balance of the profit and loss account is £5446; and to pay the usual dividend, it will be necessary to take £206 from the reserve fund. The Resident Engineer (Mr. T. Travers) reports that the manufacturing plant worked satisfactorily during the past half year.

At the half-yearly general meeting of the Derby Gas Company last Wednesday, the Chairman (Mr. H. Swingler, J.P.) congratulated the shareholders on the condition of the Company, and upon the success of the working in the half year ending Dec. 31 last. There had been an increase in the supply of gas amounting to 15,218,000 cubic feet during the past year. There was a small decrease in the item of public lighting, because the Derby Corporation had extended their electric light. The public lighting department was, however, one in which they could best afford a decrease, because that class of gas was the cheapest the Company sold. The worst feature in the accounts had been in the coke and sulphate sales. The total loss in respect of these two residuals amounted to £2226. There was a slight increase in the price of tar; so that, roundly speaking, the Company had lost on residuals about £1900. The demand for gas-stoves showed a quiet increase. At the end of 1895, there were 702 stoves out, and nearly 300 sold. The net result of the year's working, after paying full dividends, would be the carrying to the reserve fund of £887. This was very satisfactory, for it made the reserve fund stand at £12,659. He moved the adoption of the report. The motion was seconded by Alderman Newbold, and carried. The Chairman next moved the payment of dividends for the half year at the rates of 10, 7, and 5 per cent. per annum on the different stocks, which was also carried. Mr. E. Johnson, in moving a vote of thanks to the Chairman and Directors, said the Board gave the Corporation a very dignified answer to their letter in regard to the proposed acquisition of the gas-works, when they said that, as they had no desire to sell their undertaking, they had no suggestion to make. The motion having been carried, the Chairman, in reply, said he had purposely abstained from referring to the negotiations with the Corporation, but he would now say the answer was a proper one.

Notwithstanding the competition of the electric light, the income of the Dover Gas Company for gas supplied in the half year ending Dec. 31 last increased by £216; and 49 new customers were placed upon the books. At the same time, this gain was counterbalanced by the depreciation in the market value of sulphate of ammonia. During the past year, the Directors expended a considerable sum in fixing incandescent burners in a number of public lamps. But for these and other abnormal expenses, the profit earned would have sufficed to pay the usual dividend. The amount in hand available for this purpose, including the surplus profits of previous years, being ample, the Directors recommend the usual dividend at the rate of 7½ per cent. per annum, less income-tax. As briefly mentioned in the "JOURNAL" last week, the Directors have entered into a contract with the Corporation for fixing incandescent burners to all the remaining public lamps. As the expense of this alteration will be large, they stipulated for a contract for three years, over which term the cost will be spread. The maintenance of the lamps under the new system will entail greater expense than that of the old lamps; but the Directors believe that, by the arrangements they have made, a very great improvement, both in the public lighting of the town and in the Company's position, will be effected without any undue strain upon the finances. The sale of gas in the past six months produced £11,423; residuals yielded £3687; meter and stove rentals came to £651; and the total revenue was £15,914. The expenditure for coal was £5718, the town dues on which amounted to £602; and the total expenses were £13,471—leaving a balance of £2443.

The annual meeting of the Ipswich Gas Company was held on Monday last week—Mr. G. A. Biddell presiding. The report which was submitted announced that the profit and loss account showed a balance of £13,163, including the sum of £3901 brought forward. Of this amount, £4397 had been applied in the payment of an interim dividend at the rates of 11⅓, 9, and 8½ per cent. on the various classes of stock; and the Directors recommended a further payment at the rates of 12, 9½, and 9 per cent. A balance of £4051 would then remain. There had been an increase of 9·18 per cent. in the output of gas, which, coming as it did on a large increase in 1894, was all the more gratifying. The Directors were able to enter into contracts for coal at slightly reduced rates last June; but the value of this reduction had been largely discounted by the falling-off in the value of both coke and sulphate of ammonia. Apart from these drawbacks, however, the Company's prospects were encouraging, for not only had the number of consumers largely increased; but, thanks to the introduction of the incandescent burner and the increasing use of heaters and cookers, gas had become more popular than ever. In the early part of last winter, the Company initiated an experiment in street lighting by the aid of incandescent burners; and the results were so satisfactory that the Town Council decided to have the burners installed in 879 of the lamps in the borough. This installation the Company had successfully carried out with very satisfactory results. Regarding the works, alterations and additions to the exhausting and pumping machinery, and the rebuilding of the exhauster, engine, and boiler houses had been successfully carried out by the Company's own workmen from the Engineer's (Mr. J. T. Jolliffe's) designs, and under his direct supervision. The Engineer was now preparing plans for a new gasholder and tank, for which the Directors would probably invite tenders in the autumn, so as to have it ready for use by the winter of 1897, if desirable. In moving the adoption of the report and accounts, the Chairman said he had no doubt that the increased dividend would be acceptable to the shareholders; and, after paying it, they would have a balance of £4050, which was £150 in excess of 1894. For five-and-a-half years, the price of gas had been at the nominal figure of 2s. 10d. per 1000 cubic feet (which, with discounts, amounted to 2s. 8d. only); but not till this half year had the proprietors received the full dividend their Act allowed. Speaking of the relation of the share capital to the quantity of coal carbonized, he said that in 1894 it was £6 per ton; ten years ago, it was £8 per ton; and (in spite of their having spent £3459 on capital account) it now stood at £5 12s. 7d. per ton. Looking at the revenue account, he said the total expenditure was £32,580—being £3520 more than last year; and this was made up by nearly £800 more for coals, £440 for wages, £1400 for repairs of retorts and plant, over £750 for public lamps—a good deal of which was for incandescent burners—and purifying and other small items, £150. The receipts on the other side showed: Sales of gas, meter and stove rents, £31,482, being an increase of £2650; and residuals, £10,800, being an advance of £860. Included in this latter item was an increase of £180 for tar, and of £1160 for coke and breeze. The improved receipts for coke were due to greater quantity and better quality. The price had been considerably less than it was in the previous year; but they were getting a good name for the excellent quality of their coke. Then came an ugly feature—the loss of nearly £500 on sulphate of ammonia. They had used 22,766 tons of coal—an increase of rather more than 2000 tons, or nearly 10 per cent. They had sold 221 million cubic feet of gas, which was an increase of 9·18 per cent., due largely to the unusually severe weather of last winter, and to prepayment meters. The make of gas per ton of coal was 10,400 cubic feet; and the sale, 9700 cubic feet. The sale in 1878 was double what it was in 1864 (14 years); and it had again doubled since 1878 (17 years). The penny-in-the-slot meters continued to increase the receipts for gas. Last year the total amount received was £3262, or 783,000 pennies, weighing nearly 7 tons. Up to Christmas last, 1850 of these meters had been fixed, showing an increase of about 700; while 150 had already been fixed this year, and 250 more were now on order. Mr. D. Ford Goddard, M.P.,

in seconding the motion, referred to the good management at the works, and stated that last year 1000 tons less coke were used in heating the retorts than in the previous year, although 2000 tons more coal had been used. The motion was unanimously adopted.

The annual meeting of the Leighton Buzzard Gas Company was held on Monday last week. The report showed a profit of £1288; and the Directors recommended the payment of dividends of 8 per cent. on the original stock and 5⅜ per cent. on the new ordinary stock, which, with the previous balance, would leave £185 to be carried forward. The Directors expressed great satisfaction at the steady increase in gas consumption, but regretted the decline in the market for residuals. Mr. Richmond, a Director, said they had very much hoped to reduce the price of gas; but, owing to the heavy and increasing item for rates, on which they paid £280, they could not do so until they obtained better prices for residuals. The rates were about equal to 1d. per 1000 cubic feet. Mr. C. F. Ruggles (the Manager and Secretary) said the increase in the sales amounted to £270; but residuals had gone down considerably in price—sulphate of ammonia being almost a drug in the market. The Company's prospects, however, were most encouraging, and gas heaters and cookers were becoming very popular. The "slot" meters had answered extremely well; and business would grow extensively in this direction.

The revenue derived by the Leominster Gas Company, Limited, from the sale of gas in the past year was £3047; and the expenditure in connection with its manufacture came to £2257. The total receipts were £3854; the expenses, £2976—leaving a balance of £878. The Directors, at the meeting of the Company last Thursday, recommended dividends for the past half year at the rates of 10 and 7 per cent. per annum. There was a satisfactory increase of 1,184,500 cubic feet in the consumption of gas, or at the rate of 8¾ per cent., as compared with 1894. For this the Directors and the Manager (Mr. C. Eastment) are alike to be congratulated.

At the half-yearly general meeting of the Reading Gas Company last Tuesday, the Directors reported that the sale of gas in the second half of last year had considerably exceeded that of the corresponding period of 1894, notwithstanding the great progress made in the use of the incandescent gas-light, with its attendant decrease in consumption. The Directors expressed their pleasure in alluding to the fact that the reports of the Public Analyst of the Corporation of Reading upon the illuminating power and purity of the gas proved that both had been maintained during the six months at a point considerably above the statutory requirements. The accounts accompanying the report showed that the receipts from the sale of gas amounted to £21,567; and from residuals, to £5828—the total revenue being £27,452. The expenditure amounted to £22,515 (£12,086 being for coal); so that the balance carried to the profit and loss account was £4937. The sum available for division was £16,404; and the Directors recommended the payment of the full dividends upon all the stocks and shares of the Company. The works (under Mr. E. Baker, Assoc.M.Inst.C.E.) carbonized 14,293 tons of mixed gas coal; and of the total gas produced and in store, 140,752,400 cubic feet were sold inside the borough, 3,940,500 cubic feet beyond the boundary, and 9,918,589 cubic feet for public lighting and under contracts. The production of residuals was as follows: Coke, 14,293 chaldrons; tar, 158,421 gallons; and ammoniacal liquor yielding 150 tons of sulphate. The report was adopted.

The balance-sheet of the Rochester, Chatham, and Strood Gaslight Company shows receipts for the past half year to the amount of £28,600, and a net profit of £3048. Dividends of 10 and 7 per cent. have been declared.

The accounts presented at the annual general meeting of the Sleaford Gas Company, Limited, on the 11th inst. show that a net sum of £3151 was produced by the sale of gas; and that the total revenue for the year 1895 was £4329. Adding the amount brought forward and the stocks of coal, coke, &c., and meters and fittings, the total receipts stand at £10,264. The cost of working (under Mr. H. Wimhurst) came to £3009; stocks are put down for £2003; the dividend for 1894 came to £840; £250 was transferred to the reserve, and £250 repaid to that fund; and there was left a balance of £3911. The Directors recommended a dividend at the rate of 7½ per cent.

The proprietors of the Wakefield Gas Company assembled yesterday week for the purpose of receiving the report and accounts for the half year ending Dec. 31. The former stated that the balance available for division was £6477; and the Directors recommended the payment of dividends as follows: At the rate of 11½ per cent. per annum on the old shares, 9 per cent. on the £5 "B" fifths, and 8½ per cent. on the £10 shares. The revenue account showed that the income amounted to £18,010, of which £14,108 was received for gas, £517 for meter-rents, £3262 for residual products, and the remainder was made up of small items. The total expenditure was £13,237, of which £9323 was spent in the manufacturing department, £1268 on distribution, and £1878 was absorbed by rents, rates, and taxes—the balance consisting of small amounts. The profit carried to net revenue account was £4773. The quantity of coal used in the half year was 11,912 tons; and the estimated production of residuals was: Coke, 7147 tons; tar, 689 tons; and ammoniacal liquor, 1908 tons. The Chairman (Mr. W. Statter, J.P.) presided at the meeting; and, on his motion, the report and accounts were adopted.

The shareholders of the Weymouth Gas Company met on the 13th inst. In moving the adoption of the report and accounts, which were noticed in the "JOURNAL" for the 11th inst., the Chairman (Mr. R. Thomas) said it was exceedingly gratifying to him to discharge this duty, as the shareholders would observe by the report that the success of the Company was a continuous one. If they referred to the corresponding period of last year (which was rather an exceptional time, owing to the very severe weather which prevailed), it would be seen that they had largely increased the consumption of gas. In order to meet the extra requirements, an additional outlay would have to be incurred on the works. The Directors had anticipated these wants in some degree by erecting the big gasholder which was so conspicuous at the works, and by which the business would be carried on more economically. As the demand increased, provision would have to be made for further retorts, as the present ones were taxed to their utmost capacity; and, when the occasion arose, they would be obliged to go to Parliament to increase the capital. These additions, when completed, would enable them to work more economically; and consequent upon the larger consumption of gas in contemplation, the Directors would be in a position before very long to make a further reduction in the price of gas. Since the works had been in their hands, now 30 years, their object had been achieved to a large degree—viz., the reduction of the price to the consumers. Before they took over the undertaking, the price was 5s. per 1000 cubic feet; but now it had been reduced to 3s. 8d. Alluding to the progress of incandescent gas lighting, he referred to a visit he had made, with their Manager and Secretary (Mr. J. Lowe), to Winchester, where nearly all the public oil-lamps had been displaced by the incandescent light; and he publicly thanked the Manager of the Winchester Gas-Works (Mr. F. G. Dexter) for the courtesy shown them. Before concluding, he said the shareholders would see from the accounts that the Directors had but a very small balance to work upon; and this would necessitate the calling up of outstanding capital. The report was adopted; and dividends of 10 and 7 per cent. were declared. In acknowledging the usual complimentary vote, the Chairman alluded to the zeal and energy which the whole of the officials displayed, and concluded by proposing a vote of thanks to Mr. Lowe.

The half-yearly general meeting of the Yeadon and Guiseley Gas Company was held on Wednesday last—Alderman T. Denison in the chair. The Secretary (Mr. E. Lister) submitted the Directors' report, which stated that the manufacture and sales of gas for the six months ending in December showed an increase of 11 per cent. over the corresponding half of 1894. The amount received for gas and meter rents was £4505; and from the sale of coke, tar, liquor, and other residuals, £1237—the total income being £5874. The expenditure amounted to £4437; leaving a net profit of £1437. Dividends of 10 per cent. on the consolidated stock and 7 per cent. on the new shares were recommended. This absorbed £1202; leaving £225 to be carried forward. During the half year, 3958 tons of coal were used, at an average cost of 11s. 2d. per ton, as compared with 3168 tons, at 11s. 8d., for the corresponding half of the previous year. The report was adopted.

### Water Companies.

The Brompton, Chatham, &c., Water Company had, in the half year ending Dec. 31 last, an increase of £387 in their water-rental; making the gross amount £9556. The number of supplies at the date named was 15,186. A dividend at the rate of 10 per cent. per annum is to be paid.

The Kettering Water Company held their half-yearly general meeting yesterday. The revenue for the twelve months ending Dec. 25, 1895, was £4874, as compared with £4345 in the preceding year; being an increase of £529. Including the balance of £419 brought forward, the profit and loss account amounted to £3310. Deducting the interim dividend paid in September and the interest upon debentures, &c., there was left an undivided balance of £1587; and the Directors recommended the payment of a dividend at the rates of £6 15s. per cent. per annum (being 6s. 9d. per share) on the "A" capital, and £4 15s. per cent. per annum (being 4s. 9d. per share) on the "B" capital, both free of income-tax—making an average dividend for the year of £6 10s. per cent. per annum on the "A," and £4 10s. 10d. per cent. per annum on the "B" stock. This would absorb £1284, and leave to be carried forward an undivided profit of £303. The Manager (Mr. T. A. Simpson) reported that the works were in good order, and that an excellent supply of water had been distributed throughout the Company's district; also that, notwithstanding the great quantity run to waste, and the small rainfall, the water in the Cransley reservoir only fell 4 feet below its highest level, and never had less than a year's supply therein during the six months.

The accounts of the Newcastle and Gateshead Water Company for the year ending the 1st inst., which will be presented to the shareholders to-day, show that the revenue from all sources amounts to £114,253; being an increase on the preceding year of £3289. The total working expenses are augmented by the sum of £2085. This would, however, have been greatly exceeded in consequence of the large expenditure arising out of the exceptionally severe frost of last winter, but for the fact that a considerable saving has been made, as compared with the year 1894, in the cost of pumping from the Tyne for trade supply. The balance of revenue, carried to the credit of the dividend and interest account, is £80,181. From this has to be deducted the interest on the debenture stock and loans and the interim dividend paid in August last—together, £47,417—leaving a balance of £32,764. Adding the balance of undivided profit brought forward, £6028, there remains an available sum of £38,792, which the Directors recommend should be disposed of as follows: Dividend on the preference stock, £12,915; a dividend after the rate of 8 per cent. per annum on the ordinary stock (making with the interim dividend paid in August last 7½ per cent. for the year), £15,535; and a dividend after the rate of £5 12s. per cent. per annum on the stock created under the Act of 1876 (making with that paid in August last £5 5s. per cent. for the year), £8960—leaving to be carried forward £1382. The anticipation expressed by the Directors in their last report as to the completion of the Rede pipe-line was fulfilled. In July the water was turned into the pipes; and an excellent supply has been received into the reservoirs from the Rede district. The prompt and satisfactory completion of this pipe-line has given much satisfaction to the Directors. They consider that it reflects credit not only on the Engineers and others responsible for the work, but also on the pipe manufacturers; for, out of the total length of 27 miles, after severe testing, not a single mishap has occurred. The new filter-beds at Whittle Dean are approaching completion; and the new 30-inch main from Newburn to Gateshead was commenced in July last. During the twelve months, 29,830 yards, or nearly 17 miles, of mains and service-pipes were laid.

According to the report to be presented by the Directors of the South Staffordshire Water Company to the proprietors at their half-yearly meeting next Thursday, the number of houses connected during the six months ending Dec. 31 was 2006; making the total supplied 88,373. The gross amount of water-rates was £46,070, as against £43,492 in the corresponding period of the previous year. After providing for interest on the debenture and preference stocks, the amount remaining for division (including £139 brought forward) is £19,011; and the Directors recommend the declaration of a dividend on the ordinary stock at the rate of 5½ per cent. per annum, less income-tax. The amount of

this dividend being £15,817, there will remain £3194 to the credit of next half year. A sum of £30,000, part of the new stock authorized at the last meeting, has been issued as 5 per cent. preference stock, class "E;" and the whole of this £30,000 has been taken up at the price of £160 per £100 of stock. The Company's Engineer (Mr. H. Ashton Hill, Assoc.M.Inst.C.E.) reports that the machinery, plant, and reservoirs are in good order and substantial repair.

Presiding at the recent half-yearly meeting of the Stockport Water Company, the Chairman (Mr. G. H. Hill) pointed out that the expenditure had increased by £897 during the six months, compared with the corresponding period of 1894. Of that sum, £197 was due to rents, rates, and taxes. The rates had increased enormously in recent years. In 1880, the amount paid for rates was £767; in 1886, it was £795; and in 1895, £2406. The advance in the ten years on this item was equal to about 200 per cent. There had been an increase of £300 in water-rents; and an addition to the meter supplies in the Alderley, Bredbury, and Marple districts. The total increase in the receipts was £652, so that it would be seen the one increase balanced the other. Speaking of the progress of the Company, he said that in 1867 no dividend was paid; in 1868, it was 1¾ per cent.; and since that time, it had advanced until it had reached 6½ per cent. After deducting the interest on debentures amounting to £1132, the profit of the past half year was £8377. This, with £307 brought forward, left a balance in hand amounting to £8685. The dividends would absorb £8434, which would leave £251 to carry forward. The report was adopted. The Chairman subsequently gave some information relating to the well at Wilmslow, which he said was intended to supply the districts from Alderley Edge down to Cheadle. They were engaged in pumping at Wilmslow; and he was confident the well would prove a great success. It was 600 feet deep; and the water was obtained from the pure red sandstone. They estimated the yield at 700,000 to 800,000 gallons per day.

The accounts to be submitted to the shareholders of the Sunderland and South Shields Water Company to-day, show that there was a slight increase in the revenue in the twelve months ending Dec. 31 last; but that the expenses augmented in a much greater degree—principally owing to the cost entailed by the exceptionally severe weather in the beginning of the year. The Directors will recommend a dividend at the rate of 4½ per cent. on the ordinary and preference stocks for the half year; making, with the interim dividend paid in September last, 9 per cent. for the year, and also that interest at the rate of 5 per cent. per annum be paid on the amount called up on the allotted shares. The balance on profit and loss account is £45,579. The extensions already undertaken or arranged for by the Directors, under the provisions of the Sunderland and South Shields Water Act, 1891, for the supply of water to the whole of their district, are as follows: A pumping-station at Seaton Bank Top, the supply from which is now equal to 700,000 gallons per day; land for a service reservoir at Easington; land for a new pumping-station at Thorpe, where boring has already commenced; land at Down Hill, Boldon, for a service reservoir for the supply of the Tyne district. Contracts have also been entered into for 7000 tons of pipes, 21 to 30 inches in diameter; and the laying of these from Seaton, across the country, under the River Wear at Hylton, to the Tyne district is now progressing. The Directors are fully convinced that, on the completion of these projects, the supply of water in all parts of their district will be ample and satisfactory. To meet the payments to the various contractors as they become due, the Directors propose to raise on mortgage £30,500, the whole of the amount yet remaining to be borrowed under the Act of 1868; to call up the balance due on the shares allotted on Sept. 3, 1875; and to sell by auction from time to time such portion of the additional shares authorized by the Sunderland and South Shields Water Act, 1891, as may be required.

**The Relaying of the Kent Water Company's Mains.**—The Secretary of the Kent Water Company (Mr. A. Dickson) has informed the Dartford District Council that, with the view of avoiding a repetition of the trouble caused last year by the intense frost, the mains have been lowered, at a cost, inclusive of incidental work, of £20,000.

**Proposed Incorporation of the Ashford Gas Company.**—Mr. J. Morton, the Manager of the Ashford Gas Company, has informed the Ashford District Council that the Directors intend to apply to Parliament for power to incorporate their undertaking; and, in the meantime, they are acting under the advice of an expert with a view to being able to ensure an ample supply of gas to the town and district. The Council consider this a very important communication, for they recently applied to the Directors to enter into negotiations for the sale of their works to the Council; but the proposal was declined As a consequence, the Council do not feel called upon to acquiesce in the proposal to incorporate the Company. This would, they say, debar them from erecting their own gas-works, besides giving the Company a great deal more power than they now possess.

**The Proposed Purchase of the Deal Water-Works by the Local Authorities.**—The Joint Committee of representatives of Deal and Walmer which was appointed to consider the question of purchasing the local water-works, have agreed upon a report. It states that the capital of the Company is at present £27,867; a further £13,000 remaining to be called up. The liabilities and assets are put approximately at £5000; and the balance of profit on the year's earnings in June last amounted to £2023. The Committee are of opinion that a sum of between £40,000 and £50,000 will be required for the purposes of the scheme. The Directors of the Company have been communicated with; and a reply has been forwarded by Mr. W. R. Hammond, the Secretary of the Company. In the course of it, he states that the Directors have no desire to offer opposition to the proposed purchase of their undertaking; but, knowing its value, they are not disposed to have this settled by arbitration. As a consequence of this letter, the Committee recommend their respective Councils to issue the usual statutory notices in respect of an application to Parliament for powers to compulsorily acquire the undertaking, as they cannot see their way to make an offer to the Company. Another attempt is, however, to be made to get the Company to agree to arbitration; and only in the event of failure will parliamentary proceedings be commenced.

## CARBONIZING MACHINERY USED IN THE MANUFACTURE OF COAL GAS.

### Lecture by Mr. Alexander Wilson, of Glasgow.

Last Saturday evening, a lecture on the above-named subject was delivered by Mr. Alexander Wilson, of the Dawsholm Gas-Works, before the Scientific Society of the Glasgow and West of Scotland Technical College.

In opening his lecture, Mr. Wilson remarked that, although its title was as given above, it would perhaps be well if he were to be allowed, by way of introduction, to give a brief description of the process of gas making, and of the principal portions of the apparatus used in gas works. There was, he said, a popular idea of a gas-works that it was something on the lines of the Chicago pork factory, only, instead of the historica lpig at the entrance and the sausage at the exit, gas managers were credited with a coal waggon and the contents of the gasholder. The coal waggon was certainly the starting-point of the process of gas-making; and if the audience followed the journey of the contents of the waggon through the different portions of the apparatus, they would perhaps receive a slightly better description of a gas-works than he (Mr. Wilson) was able to give them when they visited Dawsholm.

Starting with the coal as brought by waggons into the works, the lecturer traced it through the coal store, where it was broken into pieces of suitable size, and then shovelled into the retorts, where it was subjected for two or three hours to a temperature of about 2000° Fahr., so that its constituents which had remained together in harmony for many ages might be separated and made to travel different paths. The retorts were briefly described, together with their arrangement in the retort-bench. Mr. Wilson next explained how they were heated by gaseous fuel generated in Siemens producers, whose mode of action he explained in a very clear manner. Some remarks followed in regard to the secondary air supply. Next in order interesting remarks were made regarding the retort mouthpieces, and how they are made air-tight; the ascension pipe, and the hydraulic main, and the manner in which its important function is discharged. The condensing and exhausting apparatus next came in for consideration; and then a description was given of the mode of action of the "Walker" purifying machine and of the "Holmes" washer-scrubber, both of which are in use at the works under his charge. He said that the last-named piece of apparatus perhaps more literally embodied the idea of what a scrubber ought to be, seeing that in it the gas was actually "scrubbed" by revolving circular brushes working in water and weak ammoniacal liquor. By-and-by the scrubbed and washed gas, thus deprived of its soluble impurities, was followed to the purifiers, which were described and their mode of operation explained—hydrated lime only (no oxide of iron) being used at the Dawsholm works. The station meter also received some consideration at the hands of the lecturer, who enabled his auditors to form a clear conception of its structure and the manner in which it does its allotted work. Then came the gasholders, with an account of the mode in which they act—especially those of the telescope type—and how the gas gets into and out of them.

Mr. Wilson subsequently dwelt at greater length on some of these points, and again brought the gas in a finished state through the station meter to the holder, to await the time when it was required by the consumers. He then said that the members would no doubt be wondering where the apparatus was kept which was required "for pumping the air into the gas," which was so much spoken about by gas consumers when their gas bills for the quarter came to hand. There was also the machine for making the consumers' meters go round whether gas was being used in the house or not—for, of course, scarcely any persons would admit that they had used all the gas the meter had registered against them, and for which they had to pay. Proceeding, he remarked that when he told them that every addition of 1 per cent. of air reduced the illuminating power of the gas 6 per cent., they would see at once that it was not to the interest of gas manufacturers to admit even the slightest quantity of air into the gas; for the gas was regularly tested for its illuminating power by officials who were outside of the gas department of the Corporation. Then, again, if they would only examine the construction of the consumers' meters (several examples of which were exposed to view on the table), they would see for themselves that the index hands would only go round when there was gas passing through the meter. Furthermore, every meter was specially tested and stamped by the standards department before it could be sent out for use; so that there was not much chance of error in the registration by the meter. He (Mr. Wilson) was inclined to think that the main cause of the grumbling that one sometimes heard was that, without being aware of it, every consumer required a great amount more light than was formerly the case. When the electric light was first introduced, it was prophesied that in a short time gas-works would be shut up, as nobody would use gas; and, as a matter of fact, the price of gas shares fell to a very low figure, although they were now higher than ever they had formerly been. But the electric light, instead of being an enemy to gas, had turned out to be a good friend; for it had given every person a taste for more light, and no one would be satisfied now-a-days with the dingy appearance of rooms that was due to the small burners that were in use ten or fifteen years ago. In fact, he believed it to be the case that everyone now used very much more artificial light for every purpose than our fathers and grandfathers did. They were, indeed, well content to jog along with a small quantity of artificial illumination. That people could be educated up to a desire for more light was proved by the fact that the greatest increase in gas consumption occurred in districts where the electric light was most in use.

Having given his audience a general description of the apparatus throughout the works, the lecturer then went on to give a more particular account of the machinery lately adopted in the carbonizing department, starting again with the coal. The system adopted now, however, was not to discharge the coal into the store but into wooden hoppers, the bottoms of which had sufficient slope to allow of the coal finding its way by gravity into shoots, by which it was fed into the coal-breaking machines, which were described with some detail. The coal, broken to a suitable size for easy carbonizing, was traced

through the elevator to an overhead storage tank having a capacity of about 20 tons, which was also about the quantity that a breaker and elevator could deal with in an hour. From the bottom of the storage tank, there was a shoot, with a movable nose-piece, sloping down to a suitable position for filling the hoppers of the charging machine, which was worked by hydraulic power. This machine and its companion, the hydraulic drawing machine, were fully described by Mr. Wilson, and their structure and mode of action were clearly illustrated by large wall-diagrams. The machines in question are those known as the Foulis-Arrol stoking machines.

Some interesting information was next given by Mr. Wilson regarding the mode of dealing with the spent coke as taken out of the retorts, and conveyed to the coke yard by tipping waggons drawn by small locomotive engines, which were briefly described. A gantry about 300 feet long, and carrying a travelling steam crane, was spoken of as working on an elevated 8-feet gauge railway, and operating a dredger bucket or grab, which picked up the coke from the heap alongside, and passed it on to the hopper of a rotary screen, in which it was separated into three sizes, which found their respective ways by means of shoots to that number of railway waggons.

At the close of the lecture, a very cordial vote of thanks was passed to Mr. Wilson.

## COOKING BY GAS IN LARGE ESTABLISHMENTS.

While so much attention is being given to the great development that is taking place in the use of gas for lighting and cooking purposes by inhabitants of small dwellings, and its increasing popularity with a class of people who, till now, have not had its benefits brought home to them, it may be useful to mark the growing demand for gas by large establishments. We are not now referring to manufactories, in which gas can be employed with the advantage alike of speed, accuracy, and economy, but rather to public institutions such as hospitals, workhouses, asylums, restaurants, hotels, trading establishments, and the like. It may be thought that most of these places are already large consumers of gas. No doubt they use a good deal for lighting purposes; but in many cases their culinary arrangements are very much behind the times. Certain institutions have obsolete patterns of cooking appliances which may or may not have answered their purpose a few years ago, but which give very poor results when compared with the efficient productions of the present day. We had occasion in our issue for Oct. 22 last year, to point out how the firm of Messrs. Fletcher, Russell, and Co., Limited, of 134, Queen Victoria Street, E.C., had set themselves the duty of meeting the requirements of large institutions by a liberal display of gas apparatus suitable for this special purpose; and we are glad to learn that the remarks then made have proved useful. We find that hospitals are now providing their nurses' duty-rooms with recesses in which specially adapted gas-ranges are placed, so that food may be cooked expeditiously and (what is probably of more importance) with the greatest cleanliness. The latter virtue is one that will surely not be overlooked by any hospital authority. If, in addition to these ranges, we add the huge ovens and grillers in the main kitchens, it will be at once perceived that the use of gas is not only a benefit to the hospitals themselves, but also to the gas companies supplying them. This movement in the direction of the more liberal employment of gas is also taking place in the case of workhouses and asylums. There is, however, still much to be done among hotels, restaurants, and trading establishments, where many assistants are engaged; and we think if the proprietors of these places would finally decide to try the simple and ingenious appliances that have been designed for their special use, whereby the cooking for from thirty to fifty persons, or even more, can be done easily, perfectly, and economically, they would soon be convinced of the superiority of gas to solid fuel for their purposes.

## THE DANGERS OF ACETYLENE GAS.

### The Explosion at New Haven (Conn.)—An Explosion at Huddersfield.

In the "JOURNAL" for the 11th inst., we reported a fatality caused by an explosion of acetylene gas at New Haven (Conn.). It will be remembered that a workman was in the act of testing a regulating-valve upon a cylinder containing the gas, when the catastrophe took place, killing him and two others, and destroying the premises. The matter was thoroughly investigated by Coroner Nix; and we learn from a local paper just to hand that the witnesses called displayed a commendable willingness to state all they knew in regard to the sad affair. The representatives of the Acetylene Gas Company invited the fullest investigation; and it is stated that they are perfectly satisfied at the treatment they received at the hands of the Coroner. It appears from the published "opinion" of this official, that the workman Hauser who caused the explosion was a machinist in the employ of Messrs. Pfleghar and Son, who had been making regulators for governing the flow of the acetylene gas as it passed from the cylinders to the burners. Some of the regulators had been perfected, and were working satisfactorily, when it was discovered that, on account of not having sufficient gas to enable them to get a high pressure for testing, a new cylinder of gas was necessary. This was procured, and attached to the regulator and its connections. The inventor had determined to produce a new top valve for the cylinders; and this was being made in Messrs. Pfleghar's shop. Hauser had been working upon it for about a fortnight, testing it nearly every day for a week, and using the old cylinder, which had been set aside on account of its reduced pressure, to make his tests. His mode of testing was to ignite a match, and apply it about the connections. He did this repeatedly, as did others who were interested in the matter. He was working upon the valve when the explosion occurred. The Coroner's opinion is that Hauser was trying to attach the new valve to the old cylinder; and, in so doing, broke off the pipe leading from the old valve. He had fixed the new valve on to the pipe from the old one as far as he thought was necessary, and then turned on the gas, and commenced to test the connections in his usual manner. The presumption is that, owing to the ruptured pipe, the gas escaped with great force, and caused the explosion; and the suggestion is put forward that the pipe would not have been broken if Hauser had had the assistance of a man to force the new valve, which weighed from 10 lbs. to 12 lbs., on to it with the help of a wrench. The Coroner concludes by expressing the opinion that experiments with explosive compounds should be conducted in separate buildings; and that an ordinance should be passed to prevent the bringing into the city and the location therein of any such compound, without notice being given to the Fire Marshal and Chief of the Fire Department as to where it has been deposited. He finds that the deaths were not the result of any criminal act, omission, or carelessness.

An explosion of acetylene gas, happily unattended by fatal consequences, occurred at Huddersfield on the 15th inst. It appears that Mr. G. Garton, a plumber, &c., carrying on business in the Market Place in that town, has devised an apparatus for the production of the gas; and it was placed in a dark part of the lower workshop on the ground floor. The cylinder is from 3 to 4 feet in depth, and about 2 feet in diameter; and it was intended to have it painted. It had been charged some days previously with carbide of calcium and water; and it was thought that the whole of the gas generated had been exhausted. Near the spot where the cylinder stood, there is a gas pendant; and the light had been turned out by a workman. Mr. Alfred Garton, son of the proprietor, had arranged to take the apparatus to pieces; and in order that he might do so, he relit the gas-jet. As he was taking off the cover of the machine, a tremendous explosion occurred; and he was thrown down with great violence. The cover was blown against a stout beam of the floor above, and fell perpendicularly on to the apparatus again. The workmen—all of whom escaped without any injury—went to Mr. Garton's assistance; and he was removed to the Infirmary. The force of the explosion was such that five or six ¼-inch plate-glass windows in different parts of the works were completely shattered. If the cover had not been blown off vertically, Mr. Garton would probably have been very seriously, if not fatally, injured. At the Infirmary, he was found to be suffering from burns and shock. It is stated that the accident arose through a slight act of indiscretion on his part, in not seeing that the machine was quite exhausted of gas before he took the top off, especially when there was a light near.

**Ottoman Gas Company, Limited.**—The Directors' report for the half year ended Dec. 31, 1895, to be presented to the shareholders at the ordinary general meeting on the 3rd prox., shows that the gas-rental for that period amounted to £9424, and the net profit to £3960. The amount standing at the credit of the profit and loss account is £4513, which the Directors recommend should be dealt with as follows: To the reserve fund, £1000; payment of a dividend at the rate of 7 per cent. per annum on both classes of shares, £2625; and carry forward, £888.

**The Coal Storage at the Leeds Gas-Works.**—The Meadow Road works section of the Leeds Corporation Gas Committee have recently held a meeting to consider the question of the coal storage accommodation. The lack of efficient storage at the works has long been felt. The last coal strike indirectly cost the Gas Committee £25,000; but had there been a better storage capacity at the time, this amount might have been greatly reduced. At present it would be impossible to store more than a fortnight's supply at the Meadow Road works; and the Committee have therefore decided to provide new sheds. They are about to build a new retort-house, and for this purpose will have to utilize a portion of the land now set apart for coal storage. This will reduce the present storage capacity from 8000 to 5000 tons. The Committee have therefore decided to erect new coal-stores on land owned by the Corporation, and adjoining the works. It is also intended to construct a branch railway to the store. When in full work, 700 tons of coal are consumed daily at the Meadow Road works during five months of the year; and the new store which it is proposed to build will hold at least 15,000 tons—bringing the total storage to 20,000 tons, or more than a month's supply.

**The Water Question at Shrewsbury.**—The reply of the Local Government Board to the request for an inquiry into the question of the present condition of the Shrewsbury Corporation water supply has only just been published. It states that the precise circumstances under which it became necessary to ascertain the views of the owners and ratepayers as to the water supply are not known to the Board; but they assume that the proceedings were taken under the Borough Funds Act, 1872, in connection with the Bill which was promoted in 1890, and upon which they reported to Parliament, and also in connection with another Bill which the Council desired to promote in 1894, but of which the Board do not appear to have received a print, if, in fact, a draft was prepared. If, continues the letter, the Board are right in their assumption as to the facts, it would appear that any scheme for the substitution of a new supply for that derived from the river must be of such a character as to necessitate the acquisition of special parliamentary powers. The Water Committee included this letter in the minutes presented by them at the last meeting of the Council, and asked for instructions upon it. Mr. T. P. Deakin, in moving the adoption of the minutes, suggested that the possession of power to obtain a Provisional Order would be the best way out of the difficulty. The Council admitted this by passing a resolution (by 20 votes to 10), authorizing an application to the Local Government Board for an Order to repeal or alter and amend the existing Water Act of 1856, so as (1) to enable the Corporation, for the purposes of their undertaking, to construct and maintain such water-works as may be approved by the Board, and to purchase by agreement any land which may be required; (2) to make section 54 of the Public Health Act, 1875, applicable to any water-mains to be laid by the Corporation; (3) to enable the Corporation to borrow further money for the purposes of the undertaking; and (4) to make further provision as to the repayment of the existing water debt.

## ELECTRIC LIGHTING NOTES.

After many months of hesitation, the Torquay Town Council decided last Friday week to proceed with the proposed electric lighting scheme for the borough. They were helped to this decision by another long report from Mr. W. H. Trentham, M.Inst.M.E., though the Council, on the recommendation of the Electric Lighting Committee, rejected one of that gentleman's most important suggestions. Two difficulties have stood in the way of the adoption of the electric light in Torquay. One is the cost and the fear that it may prove unprofitable; and the other the impossibility of finding a site wholly free from objection for the electric light station. Mr. Trentham sought to remove the fears as to the financial aspects of the matter, by referring to what has been done elsewhere. As to the site, he suggested the purchase of land and buildings now used by a firm of cabinet-makers; and he pointed out that it might be utilized for an electric lighting plant and a dust-destructor. There was no doubt, he said, that the heat from a destructor would be of value; and he estimated that the quantity of refuse available in Torquay—a ton per hour—would be equal to raising steam for 80-horse power actual. He put the cost of plant for 4000 16-candle lamps and 70 arc lamps, with the proper reserve power, at £23,716. The revenue, at 6d. per unit, he estimated at £4322 per annum, or adding £519, the cost of the gas-lamps which it is proposed to replace with arc lamps, and £150 for meter-rents, the total revenue would be £4991. On the other hand, on the presumption that the destructor would give the power estimated, the working expenses would not exceed 2¾d. per unit. Including interest and sinking fund, he put the annual charge at £4595; leaving a profit of £396 on this estimate. The cost of electricity at 6d. per unit was approximately the same as gas at 4s. 5d. per 1000 cubic feet; but Mr. W. H. Preece, C.B., was quoted in support of the contention that, by economizing the light by at once turning it out when not required, the cost in actual practice is found equal to gas at 3s. per 1000 cubic feet. In spite of Mr. Trentham's apparent preference for the site he named, the Electric Lighting Committee recommended that the central station should be placed on the cellars of the Beacon Quay, in proximity to the Bath Saloons. A good deal of doubt has been suggested as to the wisdom of putting heavy machinery in this position. But Alderman Kerswill stated that they had the authority of eminent engineers for saying that no injury would result to the Bath Saloons; and by adopting this site, they would save the cost of purchasing land. It also means abandoning the attempt to combine a refuse-destructor with the plant. But Mr. Kerswill said the Committee had come to the conclusion that the power to be derived from a destructor is so small that it would not be wise to combine the two. Mr. Trentham, who was present at the meeting, pledged his reputation that there would be no noise or vibration from the engine-room to cause injury to the Bath Saloons. The end of it all was that amendments in favour of leaving the matter to private enterprise and of instructing the Committee to find a less objectionable site were successively rejected; and the Council, by 14 votes to 4 (four other members being neutral), adopted the recommendation that power be sought to raise a loan of £22,300 for carrying out the scheme.

The Local Government Board have granted the Huddersfield Corporation authority to borrow £50,000 for electric lighting purposes, to be repaid in 25 years.

The District Council of Fareham having, by the recent poll, been directed by the ratepayers to purchase the electric lighting works, have obtained the sanction of the Local Government Board to the raising of a loan of £6681 for that and other purposes.

Street electric lighting was inaugurated in Bedford on the 6th inst.; the first area comprising 220 lamps and representing about one-third of the borough. The Bedford Corporation pay about £2000 yearly to the Gas Company for public lighting, and the substitution of electricity in the first area transfers some £700 a year to the credit of the Council's installation. The new illuminant has been extensively adopted by the townspeople. Mr. Richards, the Chairman of the Electric Lighting Committee, recently stated that the undertaking was paying back principal and interest and all expenses, and would be a source of income to the borough in the immediate future. The installation was first started on Dec. 6, 1894. For the first half year up to June 30, 1895, the receipts were £406; but from July to December, the income for electric energy supplied has been nearly doubled—the actual figures being £717. Owing to the need of extensions, the Council have decided to borrow a further instalment of £12,500 on account of the loan of £27,000 already sanctioned. This sum is made up as follows: Private lighting in specified streets, £8750; machinery at the central station, £2500; for public lighting only, £1000; contingencies, £250. The Gas Company have just called the attention of the Corporation to the danger of the close approximation of electric cables and gas-mains. In several instances, it was stated that less than a foot separated them. The Council decided to ask for a map showing the position of the mains.

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**Guildford Water Supply.**—The question of improving the water supply of the town has been under the consideration of the Guildford Corporation for some time past; but they have been very undecided as to the course to take. To help them in the matter, they consulted Mr. A. F. Phillips, who laid before them a comprehensive scheme. They, however, consider that his proposals will entail too great an outlay; and therefore, while thanking him for his valuable assistance, the Water Committee recently determined not to proceed with the scheme at present. In place of this, the Council have now adopted a recommendation of the Committee that certain works suggested by their Manager (Mr. C. H. Adams) should be carried out; and these, it is hoped, will obviate the necessity for any large outlay on the water plant for at least ten years to come. The works proposed are divided into two sections; the total cost being respectively £700 and £675. Among the machinery is a set of power pumps, which, with the existing water-power plant, will, it is calculated, give a total supply of 624,000 gallons per day—equal to 36 gallons per head for a population of 17,000. These pumps are comprised in the first section, which it is intended to take in hand at once.

## METROPOLIS WATER SUPPLY.

### Lecture by Dr. E. Frankland at the Royal Institution.

At the Royal Institution last Friday, Dr. E. Frankland, F.R.S., delivered a lecture on "The Past, Present, and Future Water Supply of London."

The lecturer began by saying he had for more than thirty years been engaged, on behalf of the Local Government Board and the Registrar-General, in the critical examination of the London Water Supply, in respect of efficiency of filtration and chemical and bacteriological quality. He proposed to consider the subject from three points of view—the past, the present, and the future; and to divide the past from the present at or about the year 1883, when, in regard to efficiency of filtration, a great change for the better occurred. Before 1829, the river water supplied to London was not filtered at all. In that year, the first filter on a working scale was constructed and brought into use by the Chelsea Water Company. But as late as 1850, only three out of the seven river Water Companies filtered their supplies; and it was not until 1856 that filtration was made compulsory by Act of Parliament. Even then for many years the process was carried on very carelessly, and improved but slowly until 1883, since which time it had been uniformly excellent. Four visitations of epidemic cholera—the last being in 1866—were the chief incentives to improvements in the quality of the water supply; for it was shown by Dr. Snowe, on the occasion of the second visitation, that the disease was propagated by impure water. At that time, the supply from the Thames and Lea was derived from the tidal reaches of those rivers, and was horribly polluted with the sewage of London. The first effect of Dr. Snowe's cardinal discovery was the removal of the intakes of the river Water Companies to positions beyond the reach of the tide and of the drainage of London. The second was the greater attention paid to the efficiency of filtration.

The present water supply was derived from four sources—the Thames, the Lea, the New River, and deep wells. The deep wells yielded, as a rule, the purest water; requiring no filtration or treatment of any sort before delivery for domestic use. The river waters required some kind of treatment before delivery—storage and subsidence in reservoirs, and filtration through sand. All river waters were affected by floods, and were of considerably different quality as regarded organic purity. From these rivers by far the largest volume of the Metropolitan Water Supply was derived; and the chemical or organic purity of the water sent out to the consumers stood in direct relation to the organic purity of the raw material used. But chemical or organic purity was only of secondary importance in a water supply; for it was now established that the spread of diseases such as cholera and typhoid fever through the agency of drinking water had no connection whatever with the chemical impurity of the water. These diseases were propagated by living organisms of extreme minuteness, to which the names bacilli, bacteria, and microbes had been given. Here came the important question: "How does filtration secure immunity from these diseases?" To Dr. Koch, of Berlin, we are indebted for the answer to this question. By his discovery of a means of isolating and counting the number of bacteria in a given volume of water, we were for the first time put in possession of a method by which the condition of water, as regarded these living organisms, before and after filtration, could be determined with quantitative exactness. The enormous importance of this discovery (which was first made known and practised in England in 1882 by the late Dr. Angus Smith) was evident, when it was borne in mind that the living organisms, harmful or harmless, contained in water were of such extreme minuteness as practically to defy detection by the microscope. But, although the microscope could not detect with certainty single bacteria or their spores, even the naked eye could easily discern colonies, consisting of thousands, or even millions, of such inhabitants.

Dr. Koch's method accomplished at once two things—it isolated, in the first place, each individual microbe; and, secondly, placed it in conditions favourable for its multiplication, which took place with such amazing rapidity that in two or three days each organism would have created around itself a visible colony of innumerable members—a town, in fact, comparable to London itself for population. By operating upon a known volume of water—such as a cubic centimetre (about 20 drops), for instance—the number of separate organisms in that volume could be counted. The effect of sand filtration, as carried out by the various Water Companies supplying London, upon the living matter contained in the raw river water was simply astounding. A single drop of Thames water passing on to the filters sometimes contained nearly 3000 separate living organisms. But it came out from these filters so cleansed from living matter, that a single drop would be found to contain not more than two or three organisms, and sometimes the filtered water was absolutely sterile. Rather less than one-tenth of the total volume of water supplied to the inhabitants of London was derived, by the Kent Water Company, from deep wells in the chalk. As it reached the wells, this water was, in all probability, absolutely sterile; but by the time it had been pumped to the surface, it usually had in it a few microbes. During the year 1892, it contained, on the average, 6 per cent.; in 1893, 13 per cent.; in 1894, 15 per cent.; and in 1895, 8 per cent. Thus, although deep-well water had, from a bacterial point of view, a decided advantage, the filtered river waters were not very far behind; and there was every reason to believe that, with the improvements now being carried out by the various river Water Companies, the Kent Company's water would before long be run very hard by the other supplies. It was important also to note that not a single pathogenic organism had ever been discovered even in the unfiltered river water as it entered the intakes of the various Companies, although these organisms had been diligently sought for. It was sometimes said that the non-pathogenic organisms found in water might be beneficial to man. But this idea was not borne out by the fact of their utter absence from the food which Nature provided for young animals. Healthy milk was absolutely sterile.

With respect to the water supply of the future, fears had from time to time been expressed that the supply from the Thames basin—that was to say, from the Thames and Lea—supplemented by water from springs and deep wells within the basin itself, would soon be insufficient in quantity. On this ground, various schemes had been brought forward for the supply of the Metropolis from other river basins—from

the Wye, the Severn, North Wales, and the Lake districts of Cumberland and Westmoreland. It was worthy of note, however, that all the Royal Commissions had unanimously arrived at the conclusion that the quantity of water to be obtained from the Thames basin was so ample as to render the necessity for going elsewhere a very remote contingency. He agreed with this conclusion; and he contended that, both as regarded quantity and quality, the Thames basin would, for a very long time to come, afford an abundant supply of water for the Metropolis. There was, indeed, no river basin in Great Britain which afforded such an abundant supply of excellent water as that available in the Thames basin. Part of this water flowed off in time of flood over the surface into the river itself. The remainder was stored up in the chalk, oolite, and lower greensand; and these were the best water-bearing strata in the kingdom. From these rocks it issued in copious springs of unsurpassed purity. For dietetic purposes, there was no better water in the kingdom than the underground water in the Thames basin. As to quantity, after the present wants of London had been supplied from the Thames, there was a daily average of about 1000 million gallons to spare; and he trusted that it was not too violent an assumption to make that the enterprising engineers of this country would find the means of abstracting and storing, for the necessary time, one-fourth of this volume, so as to tide over long periods of drought. Both bacterially and chemically, this stored water would, after filtration, be of excellent quality for domestic use. There was every reason to believe that the quantity of water obtainable from the Thames at Hampton could be increased from its present amount of 120 million gallons to 370 millions per diem; and that from the River Lea, from 54 to 100 million gallons. To these volumes must be added the amount of deep-well water obtainable from those parts of the Thames basin that lay below Teddington Lock, and in the Lea basin below Lea Bridge, and which was estimated by the last Royal Commission at rather more than 67½ million gallons per day. Thus we had the grand total of 537½ million gallons per day of excellent water obtainable within the Thames basin. Such a volume would scarcely be required for the supply of the whole water area of London at the end of fifty years from the present time, even supposing the population to go on increasing at the same rate as it did in the decade 1881-91, which was an assumption scarcely likely to be verified. There was nothing heroic in laying pipes along the banks of the Thames, or even in making reservoirs in the Thames basin. They did not appeal to the imagination like that colossal work, the bringing of water to Birmingham from the mountains of Wales; and there was little in such a scheme to recommend it to the mind of the engineer. Nevertheless, by such comparatively simple means, there was, in his opinion, every reason to congratulate ourselves that, for half a century at least, we had at our doors an ample supply of water which, for palatability, wholesomeness, and general excellence, could not be surpassed by any supply in the world; and there could, consequently, be no necessity, during that time at least, to seek for any additional supply elsewhere.

Several interesting tabular statements were displayed on the walls of the lecture-room; one of them showing how the character of the water supply affects cholera, typhoid fever, and other similar diseases in the Metropolis; while another set forth the order of bacterial efficiency of the water supplied by the various London Water Companies. It was as follows: (1) Chelsea and West Middlesex; (2) New River; (3) Lambeth; (4) East London; (5) Southwark; (6) Grand Junction. The lecture was illustrated by instructive diagrams, executed by Dr. Frankland's assistant, Mr. Burgess; and samples of polluted and unpolluted water were placed in limelight rays, with the object of showing the vast difference between them.

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### The Average Daily Supply of Water—The Constant Service.

Two parliamentary returns have lately been issued relating to the Metropolitan Water Supply—one moved for by Mr. James Stuart on Aug. 23 last; the other, by Sir Albert Rollit, on Sept. 2.

Mr. Stuart asked for a return "showing the average amount of water supplied daily by each of the London Water Companies, from various sources," in each month during the preceding two years—the quantity obtained from each source to be specified separately. The paper issued in compliance with the order of the House of Commons consists simply of masses of figures, from which a few extracts may perhaps usefully be made. Taking the Chelsea Company first, it is shown that in September, 1893, they supplied daily an average of 11,461,370 gallons of water drawn from the Thames only. By the following July, the average was up to 13,405,757 gallons; but in December, it was down to 10,940,709 gallons. All last year, up till July, there was a rise—14,014,709 gallons being reached in that month; but there was a drop to 12,684,760 gallons in August, which is the last month contained in the return. The East London Company's supply, drawn from the Thames and from their Lea works (reservoirs and wells), was 40,600,000 gallons daily in September, 1893. In the January following, it was 47,140,000 gallons; and in July, 1894, it was 48,950,000 gallons. This Company's figures for the first months of the past year are particularly interesting. In January, the daily average was 48,190,000 gallons; in February, it was 63,330,000 gallons; in March, 58,220,000 gallons; and in April, 59,210,000 gallons. The two middle months of the group cover the period of the intense frost. In August, the average supply had fallen to 43,830,000 gallons per day. The Grand Junction Water Company sent out daily from 17,116,367 to 21,660,105 gallons of water drawn from the Thames. The Kent Company began the period covered by the return with an average of 15,854,087 gallons daily; and after rising, in June, 1895, to 19,875,707 gallons, they ended with 17,377,469 gallons in August. The Lambeth Company supplied an average of 21,897,451 gallons of water daily in September, 1893; and 22,671,232 gallons in July, 1894. The bulk of this came from the Thames; the rest being pumped from land belonging to the Company. Taking the period of severe cold last year, the average daily supply was as follows: January, 21,484,156 gallons; February, 22,655,578 gallons; and March, 23,799,071 gallons. But in July, the Company sent out 28,119,163 gallons; and in the following month, 25,575,294 gallons. The New River Company's supply is drawn from ponds, springs and wells, and the River Lea. The first-named source furnished water which is not used for domestic purposes; and the figures in regard to it present a curious appearance. In September, 1893, the Company only obtained, on an average, 4290 gallons of water daily from ponds; and in the following November, only 1266 gallons were drawn daily therefrom. But the next month they were taxed to the extent of 55,611 gallons a day. In the first two and the last two months of 1894, the quantity reached 243,000 gallons; and in April, 274,000 gallons. But with the exception of June, when 170,590 gallons was the average, the ponds were not largely drawn upon. It was much the same last year, so far as the return goes. Taking the total supply, the Company began, in September, 1893, with an average of 39,055,000 gallons per diem; and they ended in August, 1895, with 39,345,000 gallons—rising in the previous month to 43,121,000 gallons, and falling in December, 1894, to 31,786,000 gallons. The Southwark and Vauxhall Water Company draw the bulk of their supply from the Thames; but, in the two years covered by the return, they obtained from gravel beds a quantity of water ranging from 1,500,000 to 7,247,000 gallons daily. In July last, they drew upon their Streatham well (for the first time) to the extent of 708,449 gallons daily; this source furnishing 1,254,628 gallons per day in the next month. With regard to the totals for the 24 months, they range from 28,701,997, in November, 1893, to 39,059,969 gallons in June, 1895. The West Middlesex Company's supply is drawn from the Thames at Hampton. Taking the two years through, the average quantity of water sent out daily was 20,000,000 gallons—falling sometimes as low as 17,799,251 gallons, but rising again to as much as 23,721,806 gallons.

Sir A. Rollit's return is mainly in regard to the constant supply. He asked for the following particulars with respect to each Company supplying water in the Metropolis: The name of each Metropolitan parish where the supply throughout is constant; the name of each where the supply is constant only in part, and a description of the part where it is constant; with respect to each parish, at whose instance the constant supply was ordered or given; the name of each Metropolitan parish where the supply is intermittent throughout; the name of each where the supply is intermittent only in part, and a description of the part where it is intermittent; and with respect to each parish or part of a parish where the supply is intermittent, the period during which water is supplied daily to the premises of consumers.

Taking first the Companies north of the Thames, the Chelsea Company afford a constant supply in Fulham; St. Mary Abbotts, Kensington; the hamlet of Knightsbridge (outward of St. Margaret and St. John's, Westminster); and St. James's, Westminster. Their supply is partly constant and partly intermittent in Chelsea; St. George's, Hanover Square; St. Margaret and St. John's, Westminster; and St. Martin's-in-the-Fields. There is no parish in the Company's district where the supply is intermittent throughout; but where this system is in use, the water is on for about two hours, on an average. This is considered ample, as the houses in the districts in question are well provided with cisterns. The constant service was put on either voluntarily by the Company or at the instance of the London County Council. The East London Water Company afford a constant supply in every parish served by them; and this was done on their own initiative. A few streets in the low-level district of St. George's-in-the-East had not a constant supply given at the Company's instance; but, after an inquiry by the Local Government Board, the few streets in question (forming only a small portion of St. George's parish) received a constant service in 1885. A small portion of Poplar was furnished with a constant supply voluntarily by the Company in 1885. It was then found that a great majority of persons had not complied with the order as to fittings; and the service was discontinued in that district. An inquiry was held; and on April 7, 1886, the Local Government Board ordered the supply to be resumed. This partial cessation of the constant service was owing entirely to the damage to property and inconvenience to consumers in the district which arose from the wretched condition of the communication-pipes and fittings. The Grand Junction Company give a constant supply in their district, without having been requested to do so by any authority. In the New River Company's district, the constant supply is very extensively employed; and it has been given at the instance of the Company themselves, the Local Government Board, the London County Council, or the Corporation of London. In most of the City parishes, the service is intermittent throughout. Where this system is in operation, the water is supplied daily to the consumers' premises for varying periods; the time allowed being in each case that which experience has proved to be amply sufficient to fill all cisterns. The West Middlesex Company give a constant supply in the whole of those parts of St. Pancras, Fulham, and St. James's, Westminster, which they serve; and in portions of Chelsea, Hammersmith, Hampstead, Kensington, Marylebone, Paddington, and St. Margaret and St. John's (Westminster). The constant service has been afforded at the instance of the Company, the Marylebone Vestry, or the London County Council. In no parish is the supply entirely intermittent; but where it is, the water is available for from two to four hours daily.

Crossing the river, the Kent Company's supply is constant in Camberwell, Deptford, Plumstead (except a few houses), Rotherhithe, and Woolwich; and constant in parts of Charlton, Eltham, Greenwich, Lee, Lewisham, and Kidbrooke. In no entire parish served by the Company is the supply intermittent; but in those parts where this system is in use, the water is on for two hours, or as long as may be necessary to complete the service. In the district served by the Lambeth Company, the supply is constant in the whole of Battersea, Bermondsey, Christ Church, Clapham, Newington, Putney, St. George the Martyr and St. Saviour (Southwark), Streatham, Tooting, and Wandsworth; and in parts of Camberwell, Lambeth, Lewisham, and Penge. The constant service was put on at the instance of the Company in every case. There is no parish served by them in the Metropolitan district where the supply is intermittent throughout; but in those places where this system is in use, the water is supplied for five or six hours daily, including Sundays. The Southwark and Vauxhall Company's supply is constant except in Battersea and Clapham, in parts of which it is intermittent; but there the water is on from about eight in the morning till five in the afternoon. The constant service has been furnished for the most part at the instance of the Company.

## THE CHESTER WATER COMPANY'S SUPPLY.

### The Pollution of the Dee.

Some consternation has been occasioned in Chester by the publication of a report by Dr. Bruce Lowe, an Inspector of the Local Government Board, on a special survey which he has made of the River Dee; and it has given rise to the gravest apprehensions regarding the water supply of the city. Dr. Lowe states that at spring tides the incoming water overtops the Chester weir—rising some feet above it, and flowing up stream past the intake of the Water Company. The attention of the Local Government Board was called in 1890 by Dr. Ballard to the fact that the pollution of the Dee below the weir could be carried on by the tidal wave into dangerous proximity to the Company's intake. The investigation shows that no fewer than twenty-one sanitary districts are included in the watershed, that Bala Lake receives sewage, and that the Dee from the lake downwards is made the recipient of pollution from houses, hamlets, and towns. Dealing particularly with Chester, Dr. Lowe points out that the effluent from the city sewage outfall works flows into the river near Sealand. When he visited the works, the treatment was hardly sufficient for the purpose, and needed to be supplemented by irrigation or land filtration. Facts show that the Dee below the weir is so polluted as to destroy the fish coming up; and when spring tides are flowing, the contaminations are carried up the river. Public opinion in Chester having been aroused regarding the drinking quality of the water, the Water Company assert that they have adopted the most modern methods of filtration. Dr. Lowe has commended the action of the Corporation in bringing about sanitary improvements, but says the water supply has become endangered by the consequent larger amount of household refuse that finds its way into the river. A stream receiving contaminations such as reach the Dee cannot be regarded as a safe source of public water supply, even if, before the water is delivered to the public, it is subjected to the best process of sand filtration. The Corporation are at present promoting a Bill in Parliament to authorize the erection of sluices at the weir, in order to prevent any sewage effluent from being carried up the river to the water intake; but it is a question whether the measures that are being contemplated will, in view of Dr. Lowe's opinion, be regarded as sufficient to purify the river so as to raise the water supply of the city above suspicion.

## THE LUTON CORPORATION AND THE WATER-WORKS.

At the Meeting of the Luton Town Council last Tuesday, the decision of the town's meeting, condemning the acquisition of the water-works on the terms proposed by the Special Committee, was reported. It was agreed that all minutes and orders made or adopted by this Committee up to Jan. 4, 1896, should be discharged and declared null and void. Mr. Wilkinson then moved that negotiations be re-opened, with a view to securing the undertaking upon more favourable terms. He denied proposing anything in the nature of confiscation; but he urged the necessity of a scheme by which the ratepayers might receive immediate advantages. He proposed to offer the Company the market value of their £50,000 capital—viz., £114,000—and add a bonus of 10 per cent., making a grand total of £125,000. The Council could easily raise the money at 3 per cent., which meant £3750; and the shareholders should have the option of leaving their money in the concern at this rate of interest in the form of terminable annuities. These would be distributed over 54 years—£1000 being redeemable the first year (this sum to be increased £50 year by year); and the actual cost to the Corporation would be £127,300. Mr. A. Oakley seconded the motion. Alderman Hucklesby did not see the least possibility of the shareholders accepting the terms; and if they could induce them to take £350 less in interest than they were now receiving, he should consider they were a splendid body of philanthropic men. He had not lost hope that the Corporation would secure the Company's undertaking; and he was prepared to submit to the Committee another scheme by which they might obtain immediate possession of the works. Mr. Smith said the Directors had told them positively that the shareholders would not agree to a cash-down transaction. Mr. Wilkinson's figures were £127,000; but the Directors had refused the offer of a lump sum of £136,000. There was no need to spend more time in discussing the scheme, as, from what he could hear, they would not now get it on the terms previously offered. Alderman Webdale maintained that the motion reflected on the Water Committee. The Deputy-Mayor (Mr. E. Oakley) said it was waste of time to discuss the matter; and it would look childish for them to ask the Directors to accept £9000 less than the sum they refused in the first instance. Mr. Cumberland thought the only sensible means of procedure was by arbitration. The Town Clerk (Mr. G. Sell) remarked that if the Company went to Parliament for powers, it would be the duty of the Corporation to oppose them. But they would have to get the same consent of the ratepayers to oppose their application as they would have done to promote a Bill for the acquisition of the works. Mr. Wilkinson, in reply, said he should be willing to abide by arbitration, as set forth in the Company's Act. On a division, the motion to re-open negotiations was defeated by 6 votes to 5.

## PLYMOUTH WATER SUPPLY.

### The New Works—Progress of the Undertaking.

From a report recently made to the Plymouth Water Committee by Mr. J. Mansergh, M.Inst.C.E., and Mr. E. Sandeman, Assoc.M.Inst.C.E., the Engineers of the new works, it appears that fair progress is now being made with the building of the dams for the reservoir. The construction of the Burrator dam, which is the main portion of the work, was commenced on the 14th of November last; and, owing to the mild weather, it has proceeded almost continuously. A large deep vein crossing the trench, the lowest point of which is 62 feet below the original river bed, has been filled with concrete. With regard to the Sheepstor dam, it is reported that the work of filling in the trench was commenced on the 16th of November. The lower part of this dam is composed of a wall of concrete 5 feet in thickness, with puddled clay between the sides of the trench and the water face of the wall. Owing to the large quantity of water which drains into the trench (450,000 gallons a day), it was a matter of some difficulty to put in the first layers of concrete with the care necessary to secure a water-tight joint; and it is reported that the cost of this portion of the scheme has been somewhat heavy. The total expenditure to the end of December was £33,832.

An interesting summary of the work and policy of the Water Committee was given in a lecture recently delivered by Mr. W. N. Elliott, a member of that body. He claimed that, under the present Chairman (Alderman J. T. Bond) and the Engineer, an entirely new policy had been initiated. The new works accomplished included the laying of 25 miles of mains in new streets and 13 miles in old ones. There had, he said, been 22 of Deacon's waste-water meters put down. In two large districts, with a population of 34,000, the pressure had been increased; and while the consumption for domestic purposes had been reduced from 48 to 30 gallons per head per day, that for trade purposes had been increased from 10 to 12 gallons. Several new districts outside the borough were now being served by the Corporation; while arrangements were being made to supply Saltash and Yelverton, with prospective supplies to Laira, Plymstock, Turnchapel, and Oreston. Through the Engineer's efforts, the Government had increased their water contribution by £300 a year for supplies to the Millbay Barracks, the Citadel, and the Admiralty reservoir. New fire hydrants to the number of 373 had been fixed in the town, making 900 altogether; and these, with the increase of pressure, had considerably reduced the danger from fire. The new pipe-line, consisting of 4½ miles of 25-inch mains, had been completed for £3000 less than the estimate. As to the new reservoir, it would cover an area of 116 acres, have a capacity of 657 million gallons, and be capable of supplying 10 million gallons per day. The original estimate of the cost of construction was £108,000; but it had since been decided to raise the main dam 3 feet higher than was at first intended. Mr. Elliott added that the water revenue was increasing by leaps and bounds; and that in the near future Plymouth would be supplying water to the greater part of the population residing within many miles of its boundaries.

**Fulwood Water-Works Extensions.**—Two years ago the governing body of Fulwood obtained parliamentary power to borrow £30,000 for the extension of the water-works. A short time since it was decided to build another reservoir; and plans and specifications for the work were drawn up by Messrs. Myers, Veevers, and Myers, of Preston. The contract has since been let to Mr. S. Johnson, of Irlam-o'-th'-Heights, near Manchester, for between £9000 and £10,000. The supply at present is drawn from three reservoirs—one at Haighton, and two (one of them a small compensation reservoir) at Goosnargh. The united capacity of these is 65 million gallons, which will be increased to 100 million gallons by the addition now in hand. The area of the surface of the water will be about 10 acres; and the depth 35 feet. The first sod on the site of the reservoir was cut by the Chairman of the District Council (Mr. J. Rogerson) on the 12th inst. It is expected the work will be completed by the end of the year.

**The Re-construction Works at the Eccup Reservoir of the Leeds Corporation.**—The members of the Leeds Corporation Water Committee paid a visit yesterday week to the works at the Eccup reservoir, where the reconstruction of the embankment is proceeding. The first portion was completed in April, 1894; and a second contract was then let for the opening out and deepening of a further length of 420 feet. This was carried out to an average depth of 168 feet. The process of filling in the puddle was then commenced; and the trench is now filled in to a depth of 139 feet—leaving only some 29 feet still to be done. It is, however, quite high enough for the contractor to commence relaying the embankments. It was again further decided, about July, 1895, to take out another short length of embankment at the north end, and to deepen that portion. The Engineer (Mr. T. Hewson) informed the Committee that the old puddle-wall had been all excavated, and that the trench was now sunk below the old bottom to an average depth of 73 feet in the shale, 9 feet wide. The average depth from the finished roadway level, he explained, was 141 feet.

**Beyrouth Water-Works Company, Limited.**—The annual meeting of this Company was held last Tuesday, at the London Offices, King's Arms Yard, E.C. Mr. W. T. Western (in the absence of Mr. Edward Easton) presided. The report stated that the gross revenue for the year amounted to £13,701, as against £13,808 in the preceding twelvemonth. After making proper allowances for proportion of cost of new machinery and depreciated value of plant, and carrying £500 to reserve for contingencies, a net balance of £7068 remained. In moving the adoption of the report, the Chairman stated that the revenue was really about £400 better than in the preceding year; the apparent loss being accounted for by the fact that an exceptional sum of £500 was received in 1894, consisting of arrears of interest recovered from the Municipality. The outlay was somewhat larger; and this was partly accounted for by the expenses incurred by the deputation of Directors who went out to Beyrouth in connection with the negotiations respecting the concession. On capital account, £695 had been spent in extensions of the mains; and the Directors were also committing the Company to further capital expenditure for steam-pumping plant; the demand for water having so increased that this was absolutely necessary. Alluding to the question of the remuneration of the Directors, he said that it was nineteen years since the Directors had had any fees; but circumstances had arisen which rendered it advisable to now come to some arrangement. After considerable discussion, the Directors, with one or two large shareholders, had decided that, in lieu of the sum of £1900 for which their Articles of Association provided, they should take £300 a year, and that, in lieu of all past fees previous to 1895, £2000 should be payable to them when the extended concession was granted—the payment being contingent on that event. Mr. D. B. M'Lachlan seconded the motion, which was passed. The retiring Directors and Auditors were re-elected.

## COMPARATIVE PRICES OF GAS AND WATER.

A return has been compiled and published by the Plymouth Mercantile Association, showing the comparative rates and the charges for gas and water in some fifty of the large towns of England in the year 1894-5. Like many similar returns compiled from time to time, it has serious omissions; and it is open to the objection that it does not enable an exact comparison to be made. In the columns set apart for a description of the ownership of the gas and water works, there are many blanks which might have been supplied at the expenditure of very little trouble. In regard to the price of gas, again, there is no reference to the illuminating power, though this is obviously not unimportant; while as to water-rates, there is so much divergence in local assessments, that the statement that a certain sum in the pound is charged for a domestic water supply may conceal considerable differences in the amount of the actual payments.

So far as it goes, the return, like the particulars compiled by the Liberty and Property Defence League, referred to a fortnight ago, shows that the cheapest gas is supplied by companies; the towns being Gateshead, where the price is 1s. 7½d.; Plymouth, 1s. 9d.; and Sunderland, 1s. 11d. (Newcastle-on-Tyne does not figure in the return). Other towns where the supply of gas is in the hands of companies are Wolverhampton, where the price is 2s.; Sheffield and York, where it is 2s. 2d.; Ashton-under-Lyne, Cheltenham, and South Shields, 2s. 4d.; Northampton, 2s. 6d.; Bristol, 2s. 8d.; Reading and West Ham, 2s. 10d.; Brighton, 2s. 11d.; Chester, 3s.; Preston, 3s. 1½d.; and Norwich, 3s. 6d. The lowest price of a corporation gas supply is 2s.—a rate which prevails in Coventry, Darlington, Halifax, and Middlesbrough. In Carlisle, it is 2s. 3d.; at Blackpool, Leicester, Leeds, and Salford, 2s. 4d.; at West Bromwich, 2s. 4½d.; at Bury, 2s. 5d.; at Lancaster, St. Helens, Nottingham, Oldham, and Stockport, 2s. 6d.; at Huddersfield, 2s. 7½d.; at Bolton, 2s. 8d.; at Burnley, 2s. 9d.; at Rochdale and Macclesfield, 2s. 10d.; at Dewsbury, 2s. 11d.; at Barrow-in-Furness and Burton-on-Trent, 3s.; at Southport, 3s. 1d.; at Accrington, 3s. 3½d.; and at Blackburn, 3s. 5d.

The variations in the charges for water supply are apparently far greater than in those for gas; for water-rates range from 7½d. in the pound—the minimum according to this table—to 2s. in the pound, the maximum. Comparatively few of the water undertakings of the provincial towns are in the hands of companies; those here given include Sunderland, South Shields, and York, in each of which the charge is 1s. in the pound; Southport, where it is 1s. 1½d.; West Bromwich, 1s. 2½d.; Newcastle and Gateshead, 1s. 3½d.; Blackpool, 1s. 6d.; and Chester, 1s. 8d. The lowest prices charged are by the Corporation of Liverpool, 7½d.; Salford, 8$\frac{1}{12}$d. (Manchester is not given); Brighton, 9d.; and Bath, 9d. to 1s. At St. Helens, the rate is 10½d.; but this is on the gross rental. Reading comes next, at 10½d.; Plymouth, 11d.; Leeds, Hull, Cheltenham, and Barrow-in-Furness, 1s.; Preston, 1s. 0½d.; Wigan and Nottingham, 1s. 1d.; Swansea, 1s. 1½d.; Leicester, 1s. 2½d.; Burnley, 1s. 2½d.; Wolverhampton, Wakefield, and Middlesbrough, 1s. 3d.; Darlington and Coventry, 1s. 3½d.; Lancaster, 1s. 4d.; Bolton, 1s. 5½d.; Northampton, Bury, Oldham, and Burton-on-Trent, 1s. 6d.; Halifax, 1s. 6½d.; Blackburn, 1s. 7d.; Sheffield and Huddersfield, 1s. 8d.; Accrington and Ashton-under-Lyne, 1s. 11d.; and Rochdale, 2s.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

Something like a scare over their adoption the previous week of the Burghs Gas Supply Act, developed itself in the Dunfermline Town Council on Monday. Having satisfied themselves that the adoption of the Act had been registered on Wednesday, the Committee who had been previously appointed to consider and report as to what steps should be taken to carry out the Act—and specially whether it was desirable to take steps to acquire the Gas Company's undertaking, met on Thursday and resolved to proceed with the negotiation. But someone perceived, or thought that he perceived, a difficulty; and the Committee were called together on Saturday, when they resolved to cancel their Thursday resolution, and call a special meeting of the Council at which to lay bare their fresh trouble. The Council meeting was held on Monday; and the Committee reported that what stood in their way was as follows: By section 20 of the Act, it is provided that after the adoption of the Act a Local Authority *may* (the italics are mine) proceed to negotiate with a gas company for the acquisition of their undertaking, with the consent of the company; but by section 21, before the Local Authority can exercise any of the powers conferred by the Act, they *shall* (italics again mine) give notice to treat. The dilemma which the Committee found themselves in was that, reading both sections together, any negotiations entered into with the Company would constitute a notice to treat, and they would be obliged to proceed, either to agreement or to arbitration. They therefore resolved to allow the Town Council to decide whether or not they should give notice to treat. There is not much ambiguity about the provisions of the two sections; and in an ordinary case there need have been no difficulty. But in Dunfermline quite a number of the councillors had informed their constituents, at the last municipal election, that they would do nothing in the matter of acquiring the gas undertaking without again consulting them. These gentlemen now felt that, if they proceeded to negotiate with the Company, they would preclude themselves from again taking the opinion of the ratepayers, and thus break faith with their constituents; or, if they did not proceed, the adoption of the Act was practically a farce. It took a good deal of talk to get themselves out of this difficulty. There was only one member (Mr. Husband) who claimed that he had foreseen the difficulty, and who said that he warned them of it in November last—even though the Town Clerk was against him. Mr. Husband moved that they give notice to treat. A motion for delay in coming to a definite decision until public meetings could be held, at which the voice of the ratepayers could be taken, was also made. In the discussion, every speaker favoured the idea of going forward, if the difficulty about committing themselves could be removed. In order to get over it, the notion was started that the poll which was taken—the result of which I announced two weeks ago—was really a reference to the ratepayers; and though others said it was merely a reference upon the question of whether they should adopt or not, and had no relation to the question of purchase, the idea seemed to be a salve to the conscience of a sufficient number. Thus, when a division was taken, it was found that ten voted to proceed and six for delay. It must be said, however, that four councillors, some of whom hold stock in the Gas Company, declined to vote; and two were absent. However, a majority was obtained for proceeding; and Provost Waller said that, as the minority were all as anxious as the majority to proceed, they might take it as a unanimous vote—a statement which was not questioned. Thereupon a Committee which was known as the Finance and Lighting Committee was discharged; and a Gas Committee was appointed.

Now, as to Mr. Husband's claim to have been the infallible one. Seeing that it was attempted to throw blame on the Town Clerk for misleading them, I beg to point out that Mr. Husband, addressing the electors in the end of October last, said that if he were elected he would vote for the adoption of the Act, "still he would do so with the expectation that the whole of the ratepayers would again be consulted in the matter." On Nov. 18, at a special meeting of the Town Council, Mr. Husband did tell them that the point where they committed themselves would be when they gave notice to treat. But then, at this meeting, the Town Clerk informed them that the adoption of the Act put them in the position of being able to say that they wished to purchase the works, and also enabled them to compel the Company to sell. The Clerk's ruling was not very clear; but it is evident that the councillors were nearly all shilly-shallying over the matter. I do not profess to interpret the two sections of the Act which put the Council about; but I scarcely think it was impossible to have approached the Directors of the Gas Company and asked a friendly conference without giving notice, if it would have done any good. In the circumstances, however, a friendly conference could not have been beneficial because several of the speakers intimated, in effect, that they would not have taken the responsibility of coming to a private agreement. It was stated, at the meeting of the Council, that public meetings would not have given the voice of the community in the matter, because many would have attended who had no interest—which was quite correct. The Town Council were thus shut up to either going on or allowing the Act to fall into desuetude, which, by the way, the Act itself does not provide for; but that matter, I have no doubt, is regulated otherwise. The Council have resolved to go on; and in this they have acted wisely. Their hesitation was not so creditable. In support of this view, I may refer to my "Note" on the subject in the "JOURNAL" for Oct. 29 last, in which I said that in some cases "the desire to adopt the Act was founded on the notion that with it in their hands they would have a compulsitor with which to approach the Gas Company in the matter of the charge for public lighting." The Town Council, in fact, or rather some of the councillors, wished to reach up, by means of the Act, and look over the Company's wall. Then, if they found matters to their liking, they would then go in by the gate, and say: "We want to buy up your undertaking." But if they were not satisfied with what they saw, they would slink away and allow the matter to drop. They wanted, in short, to run with the hare and hunt with the hounds. They have not been able to do this; and the fact that they have not, shows how carefully the Burghs Gas Supply Act was framed.

I turn now to the subject of carburetted water gas for Edinburgh. It is not much further forward. Professor Crum Brown has not yet reported on the nature of the gas; but he is making a most exhaustive investigation into the subject. He is, or has been, moving about from place to place, among the towns where carburetted water gas is being supplied, and taking samples of the gas at the point of combustion for analysis, so that he may be able to report upon the nature of the gas as it is supplied to the public. This is a little different, but not much, from the action of the Liverpool deputation who, it will be remembered, a few months ago visited Edinburgh, and took a snap-shot test of the illuminating power of the gas in the city. It is singular that the Edinburgh and Leith Gas Commissioners should have been the first to follow the example of an act which was so universally ridiculed. This "mission" of Professor Crum Brown's, to collect samples, may be productive of a considerable amount of tabulated information regarding the quantities of the various gases which are being supplied; but I should imagine the results will be somewhat confusing. When the Commissioners are making an exhaustive inquiry, I would suggest that they should make it thoroughly so. What is wanted is not to be told what percentages of the gases are innocuous and what are noxious—this is easily ascertained. But there is a deeper question than that. We all know that, as regards illuminating power, oil gas, when mingled with coal gas, gives a proportionately higher value than the quantities mixed would suggest. Has it ever been determined whether the constituents of carburetted water gas may not be similarly affected, and that some which are comparatively innocuous in coal gas, may not, in the mixture, be so operated upon chemically as to become noxious? This is a matter which could only be determined by experiment—on animals, of course—and to this the anti-vivisectionists would doubtless object. Still, it would be better to have a few rabbits or rats poisoned in this way than to have human beings exposed to risk; or, on the other hand, if there is no risk, to have it so established once for all. Another question for consideration is whether, seeing the difference in the specific gravity of the gases, there is any disposition to layering in the gasholders.

But an incident has occurred which I cannot fail to notice. A letter, signed anonymously "A Citizen," has been published in the "Scotsman" this week, which has every appearance of having been written by a person who knew what he was writing about. It is evidently the production of someone interested in coal. The writer, basing his figures upon those given by Mr. A. Wilson, of Dawsholm, in his Presidential Address at Melrose last July, says that the net cost of producing 33-candle gas should be, with modern appliances, 18·55d. per 1000 cubic feet; and to produce 16-candle gas, 6·66d. per 1000 cubic feet. To produce therefore a gas of 26-candle power—the

quality supplied to Edinburgh—with those gases, would require 588 cubic feet of 33-candle gas, costing 10·908d., and 412 cubic feet of 16-candle gas, costing 2·743d., making together 13·651d. per 1000 feet. He questions if carburetted water gas could be produced at a less, or even the same cost. He then quotes the opinions of Mr. Butterfield, of Beckton, given in his recent work, about the difficulty of purifying carburetted water gas, and as to the desirability of keeping the proportion of carbon monoxide below 10 per cent. in the gas as supplied to consumers. In the latter connection, he shows that, in the case of 16-candle gas as supplied in London, the enrichment should only amount to from 2 to 4 candles, and that it should therefore be easy to keep below 10 per cent. Where, however, it is necessary to enrich up to 26 candles, a quantity of carburetted water gas would require to be added to the coal gas which would involve the presence of an excessive amount of carbon monoxide in the gas supplied to consumers. He estimates that the percentage of carbon monoxide in the Edinburgh gas would be at least double that which Mr. Butterfield considers to be safe. As to this latter point, I may say that the writer understates the percentage which there would be in the Edinburgh gas, as it would be 24. On the subject of the cost of enrichment, I should like to point out that the figures given in the letter bring out that the cost of enriching 16-candle gas to 26 candles by means of cannel—the difference between 13·65d. and 6·66d.—is 5·99d. But Mr. Linton, in his report to the Commissioners on the Peebles process, gave the net cost of 26-candle gas, enriched from 15 candles by this process, at 14·83d. per 1000 cubic feet, which shows that the cost of enrichment by the Peebles process is 2·03d. per 1000 cubic feet cheaper than by cannel. I still stick to the Peebles process as being the cheapest and best; and I think I can show good reason for my predilection.

At the Greenock Police Board on Tuesday, it was reported that during the seven months of the financial year which have elapsed, the consumption of gas has been greater by 12,871,000 cubic feet than it was in the corresponding period of last year. This was an increase of 8 per cent., and represented about £2000 of revenue. Bailie M'Innes said that the gas-works were approaching the limit of production for which they were erected in 1871; and the Manager (Mr. S. Stewart) had submitted a report regarding extensions, which they were about to consider. Ex-Provost Wilson was afraid there was a leakage somewhere; and referred to the existence of complaints regarding gas bills being larger while no more gas was being consumed. Bailie Swan thought the increased consumption might be accounted for by a larger number of gas-engines being in use; and Mr. Shearer believed the outcry about bigger gas bills might be due to some people trying burners which they were told would lessen the gas consumption, but which had the opposite effect. Bailie M'Innes was inclined to think the increase was in some measure due to the fact that gas was cheaper. He is probably right; but from whatever cause it arises, the increase is no doubt welcome.

The Cupar Gas Company was this week registered as a Limited Liability Company. The original capital of the Company was £2500, in 250 shares of £10 each. In 1872, the capital was increased to £6250, by the conversion of the shares into £25 each. A further increase took place in 1893 by the issue of £1750 in preference shares of £7 each. The capital of the Company is now fixed at £8000 divided into 250 ordinary shares of £25 each, and 250 4 per cent. preference shares of £7 each.

The Town Council of Glasgow on Thursday considered the subject of their electric lighting installation. A report by the Gas Engineer (Mr. W. Foulis), and the Electrical Engineer (Mr. Arnot), was as follows: "We have carefully considered the saving that may be effected by transferring the arc lighting from John Street to Waterloo Street, and supplying the lamps from the low-tension mains at present used for private lighting. This transference would necessitate new lamps being procured, as the present lamps are unsuitable for continuous low-tension current. The cost of the lamps, with the necessary connections, we estimate at £1300. From the higher efficiency of the plant at Waterloo Street, as compared with that at John Street, and also from the fact that the additional current may be generated without extra cost for labour, the saving to be effected we estimate as follows: Reduction in cost of fuel, £257; wages, £431—total, £688. Additional capital would be required for plant at Waterloo Street; but the sum that would probably be realized from the sale of the building and plant at John Street would meet this expense. The saving above mentioned is equal to £6 10s. 4d. per lamp, reducing the cost per lamp per annum to £22 10s. 1d." Mr. Arnot also reported that the provision of additional plant in the Waterloo Street station would cost about £6000. The Special Sub-Committee asked that the question be sent back to them to bring up an exhaustive report. In speaking to the report, Bailie Burt said he had figures that perhaps would convince them to a certain extent that, so far as Glasgow was concerned, it had not made such a great mistake as some people would have them believe. He found that there were a good many of the high-tension systems in different parts of the country that had large deficits standing at the end of the year. In Birkenhead, there was a deficit of £1800; in Dublin, of £990; and in Huddersfield, of £2000. In Glasgow, they had in 1893-4 a capital expenditure of £120,000; and their deficit was £607. Last year the deficit was brought up to £1500, with a total capital expenditure of £141,000. He believed that they would come out this year with a very fair surplus over their expenditure; and he felt that they had now come to a position, so far as the electric lighting of the city was concerned, when the whole matter must be considered *de novo*. After a somewhat lively discussion, the Sub-Committee's report was adopted.

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**St. Petersburg New Water-Works Company, Limited.**—At the annual meeting of this Company to-day, the Directors will submit a report which states that, after providing for interest on the debenture debt, for sinking fund, for the expenses of proceedings for reducing capital, and writing off the adverse balance of £691 brought from last year, the net profits amount to £4131. An interim dividend of 3s. per share was paid in October last; and the Directors recommend a further payment of 4s. 6d. per share.

## CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 22.

**Sulphate of Ammonia.**—The quieter market at the close of last week has continued; and business done has been only on a moderate scale. Dealers have not for the most part been buying; but, on the contrary, they would seem to have gone on the "bear" tack, and to be again quoting abroad below prices recently current. On the other hand, there has been no great pressure to sell. The quotations are £8 8s. 9d. to £8 10s. per ton f.o.b. ports. In the forward position, there is more disposition to entertain business; and it is reported that July-August has been done at the equivalent of about £9 per ton.

**Nitrate of Soda** is unchanged; spot value remaining at 7s. 10½d. to 8s. per cwt., according to quality.

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LONDON, *Feb.* 22.

**Tar Products.**—Benzols are dull; and no new important business is reported. Solvent naphtha continues steady; but buyers will not pay the price asked for crude 30 per cent. naphtha. Carbolic acid is firm; and crystals are realizing a higher price than they have been for a long time. The position and prospect of pitch is somewhat doubtful; buyers being unable to make up their mind as to value for next season's delivery. There are no stocks in this country; and, it is reported that stocks in fuel makers' hands abroad were never lower than they are just now. The generally improved conditon of trade has created a better demand for fuel; but makers complain that prices are miserably low and unprofitable. The use of pitch, however, is extending largely in Germany, which probably more than counterbalances the decreased use spoken of as taking place in South Wales and Belgium. A good business is being done in anthracene; and prices are maintained.

Values current during the week are: Tar, 18s. to 23s. 6d. Pitch, 34s., west coast; 36s., east coast. Benzol, 90's, 2s.; 50's, 1s. 8d. Toluol, 1s. 6d. Solvent naphtha, 1s. 3d. to 1s. 4½d. Crude, 30 per cent. naphtha, 9½d. Creosote, 1½d. Naphthalene, pressed, 43s.; drained, 27s. 6d. Cresylic acid, 1s. 1½d.; crude, 10½d. Carbolic acid, 60's, 2s. 3d. Anthracene, "A" quality, 11½d. to 1s.; "B," 9½d. to 10d.

**Sulphate of Ammonia** has suffered a relapse during the week. Buyers will not pay more than £8 7s. 6d. to £8 10s., less 3½ per cent. at all ports, while gas liquor is quoted at 6s. to 7s. per ton.

## COAL TRADE REPORTS.

**From Our Own Correspondents.**

**Lancashire Coal Trade.**—There is still no improvement whatever to note in the coal trade of this district; the position, if anything, getting worse. The reports of the largest Lancashire colliery companies all bear evidence as to the depressed condition of trade, and declining prices. In all descriptions of fuel, the demand continues slow; and even with pits in many cases on short time, supplies are excessive, with a weak tone in rates. House-fire qualities move off but moderately; and prices are barely maintained at recent rates. Common round coals also show no real improvement, either as regards the demand for iron making, steam, and general manufacturing purposes, or the prices obtainable, which continue extremely low. At the pit mouth, 10s. per ton is now about the general selling price for best Wigan Arley; 10s. 6d. being only got in exceptional cases. Pemberton four-feet and seconds Arley range, according to quality, from 8s. up to 9s. per ton; common house-fire descriptions, 7s. to 7s. 6d.; and steam and forge coals, about 6s. per ton. There is a fair business doing in engine fuel, but no scarcity of supplies; and prices are not more than steady at from 3s. and 3s. 6d. per ton at the pit for common slack, up to 4s. 6d. and 5s. for better qualities. The business put through in the shipping trade continues of very limited dimensions; and no better prices are ruling. For delivery at the ports on the Mersey, some of the inferior descriptions of steam coal can be bought at as low as 6s. 9d. to 7s. per ton, with better sorts fetching 7s. 6d. to 7s. 9d.

**Northern Coal Trade.**—In the coal trade of this district several of the gas-coal contracts for export have now been concluded; so that there is some indication as to the range of prices that will probably rule for such supplies. But in many instances, the rates include the freight to the port of delivery, so that it is not easy to state exactly the price that the coal itself brings, as that is dependent in degree on the sum that is paid or allowed for freight. Contracts have this week been booked for Stockholm, Gothenburg, and one or two other places. That for Stockholm is for about 64,000 tons; and the accepted tender was 9s. 11½d. per ton. Last year, the average rate of freight to that port was just 4s.; and as this year the range is expected to be slightly less, there is thus an idea as to the price of the coal. The Gothenburg contract is at a slightly better price, allowing an average rate for the freight. Gas coal continues in fair demand; but both for this and for household coal the demand locally is decreasing, though there are all the signs that the export business will set in early. Prices for odd cargoes are not altered. In manufacturing coals there is little or no alteration in price. But there is an increased demand; the consumption in several local industries showing an enlargement. In regard to steam coals, the market continues depressed; but there are negotiations in progress for the contracts for coals for the shipping season. For best Northumbrian steam coals, for prompt delivery, the price quoted is now 7s. 9d. per ton f.o.b.; but for coals to be delivered over the shipping season, 8s. 6d. is the general quotation. Steam small coals are rather scarce at the present time; and the price varies from 3s. 6d. to 3s. 9d. per ton. There has been a decided increase of activity in the coke trade; and rates are not only firmer, but higher figures have to be paid to obtain supplies of the best known kinds. Generally, the export business in coke is limited; and the price varies from 14s. 6d. to 15s. 3d. per ton f.o.b. There is the most decided improvement in the home demand; more furnaces being at work both in Cleveland and in the north-west. As the demand for hematite iron has been larger of late, coke is likely to be in fuller request when the spring brings larger shipping orders with the opening of navigations that are now closed. The gas coke trade is reported as finding a better demand locally; and as the output is now

smaller, and will decrease for four months, it is probable the stocks will soon be reduced. There has been no change of price this week.

**Scotch Coal Trade.**—The market still continues flat, without any signs of improvement. Reductions of wages are being effected, chiefly in Lanarkshire, which may bring some relief. Large coal of all classes is being pressed for sale, at unchanged prices. Splint is more plentiful. Main is, if anything, easier in price. Steam coal shows no increase of business. Ell of the first qualities is selling best of all. The prices quoted are: Main, 5s. 9d. (easy) per ton f.o.b. Glasgow; ell, 6s. 9d.; splint, 6s. 3d. to 6s. 6d.; and steam, 7s. 6d. The shipments for the week amounted to 106,455 tons—a decrease on the preceding week of 9791 tons, but an increase over the corresponding week of last year of 12,048 tons. For the year to date, the total shipments have amounted to 757,899 tons—an increase upon the quantity in the same period of last year of 89,066 tons.

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**Gas Explosion at the City Gas-Meter Testing Offices.**—Last Thursday night, a gas explosion occurred at the offices of the Inspector of Gas-Meters for the Corporation of London, in Lower Whitecross Street, which were described in the "JOURNAL" a fortnight ago. Considerable damage was done to the rooms on the second and third floors of the building.

**Abandonment of the Swansea Tramway Purchase Scheme.**—What is known as the Swansea triple scheme of dust destruction, electric lighting, and electric tramcar propulsion, to which reference has been made in the "JOURNAL," has fallen through, at least as far as the last and most important section is concerned. The electric lighting scheme stands, it having been sanctioned by the Corporation; but the Corporation will see how the ratepayers regard the question. The dust destruction scheme also stands. The Corporation's Bill is withdrawn.

**The Corporation Gas Bill Rejected by the Ratepayers of Cheltenham.**—The result of the poll of the ratepayers of Cheltenham on the gas question was made known last Tuesday; and their answer to the question submitted to them—whether they were in favour of or against the resolution of the Corporation to promote a Bill in Parliament for the purchase of the gas-works—is a pronounced one. The total in favour was only 1433, and those against numbered 5936—giving a majority in opposition of 4503. There were 942 spoilt papers; and nearly 1000 papers were not filled up.

**The Prepayment Meter System for West Bromwich.**—The Gas Committee of the West Bromwich Corporation are taking steps for the introduction of the automatic prepayment gas-meter system in the borough. Calculations have been made by the officials of the Gas Department; and it is believed that the experiment will be successful—a large proportion of the population of West Bromwich belonging to the working classes. It is proposed at the outset that the Corporation shall provide the whole of the necessary fittings and pipes, so that the householders will not incur any expense in this direction.

**Sales of Shares.**—At Bradford last Thursday, Messrs. Stansfield and Co. sold some "A" £10 fully-paid shares in the Eccleshill and Bolton Gas Company for £20 each, "B" shares (£8 paid) for £16 15s., and "C" shares (£7 paid) for £12; also £50 of original stock in the Drighlington and Gildersome Gas Company for £88.——At a local sale last week, some old £20 shares in the Grantham Gas Company realized £43 15s.

**Reductions in Price.**—The Directors of the Isle of Thanet Gas Company have resolved to reduce the price of gas from 2s. 9d. to 2s. 8½d. per 1000 cubic feet from the 1st of April next. The Seaford Gas Company have allowed a further reduction of 2½ per cent. in respect of the public lighting in their district; this making a total discount of 15 per cent. The Directors of the Yeadon and Guiseley Gas Company have decided to reduce the price of gas 2½d. per 1000 cubic feet as from the commencement of the year. The price of gas for lighting purposes is to be reduced at Carmarthen, as from the 31st prox., to 4s. 3d. per 1000 cubic feet. The Colchester Gas Company have resolved to reduce the price of their gas to private consumers by 3d per 1000 cubic feet.

**The London County Council and their Water Transfer Bills.**—At the meeting of the London County Council last Tuesday, the Joint Parliamentary and Water Committee reported that the question of the position of the London County Council Water (Transfer) Bills had been occupying the attention of a Sub-Committee, who had sent in a report. Having carefully considered all the circumstances of the case, they recommended "That notice be given of the second reading of the New River, Chelsea, Grand Junction, East London, West Middlesex, and Kent Water-Works (Transfer) Bills, but that the House of Commons be asked to consent to the adjournment of the second reading; and that, in the case of the Southwark and Vauxhall and Lambeth Water-Works (Transfer) Bills, the reference to a Committee of the House of Commons be deferred." This was agreed to. The progress of these Bills is recorded in our "Parliamentary Intelligence."

**The Leakage of the New Reservoir at Redruth.**—The cause of the serious leakage in the new reservoir at Redruth has apparently been discovered; and there is reason to hope that the leak may be stopped. Mr. Manley, the Resident Engineer, had a raft made; and, by carefully watching from this, he found that currents converged to a certain point near the centre. A bottle sunk to the level of the cork invariably floated to this point. As the result of these experiments, Mr. Manley had a dam constructed round the place; and the water almost immediately drained away from it. Excavations were then made which revealed the back of a lode, and some loose material the nature of which was sufficient to account for the leakage of the 80,000 gallons a day previously reported. Since the construction of the dam, the water has not perceptibly fallen in the rest of the reservoir. After the position of the leak was located the contractor, Mr. A. Delbridge, at once set to work to remedy the defect. Water has now again been turned into the reservoir.

## GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 391).

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p. c. | GAS COMPANIES. | | | £ s. d. |
| 590,000 | 10 | 16 Oct. | 10½ | Alliance & Dublin 10 p. c. | 23½–24½ | .. | 4 5 8 |
| 100,000 | 10 | " | 7½ | Do. 7 p. c. | 16½–17½ | .. | 4 5 8 |
| 300,000 | 100 | 2 Jan. | 5 | Australian (Sydney) 5 % Deb. | 107–109 | .. | 4 11 9 |
| 203,000 | 10 | 16 Oct. | 4 | Belgrano (B. Ayres), Limited | 7½–8½ | .. | 4 14 1 |
| 100,000 | Stck. | 30 Dec. | 5 | Do. 5 p. c. Deb. Stk | 92–97 | .. | 5 3 1 |
| 200,000 | 5 | 14 Nov. | 6½ | Bombay, Limited | 7½–7¾ | .. | 4 3 10 |
| 40,000 | 5 | " | 6½ | Do. New, £4 paid | 5–5½ | .. | 4 14 7 |
| 380,000 | Stck. | 14 Aug. | 12 | Brentford Consolidated | 278–283 | +3 | 4 4 9 |
| 210,000 | " | " | 9 | Do. New | 215–220 | .. | 4 1 9 |
| 50,000 | " | " | 5 | Do. 5 p. c. Pref. | — | .. | — |
| 159,375 | " | 16 Dec. | 4 | Do. 4 p. c. Deb. Stock. | 127–132 | .. | 3 0 7 |
| 220,000 | Stck. | 27 Sept. | 11 | Brighton & Hove Original | 230–235 | .. | 4 13 8 |
| 208,820 | " | " | 8 | Do. A Ord. Stk. | 185–190 | .. | 4 4 3 |
| 933,500 | Stck. | 29 Aug. | 5 | Bristol, 5 p.c. max. | 124–128 | .. | 3 18 1 |
| 420,000 | 20 | 27 Sept. | 11½ | British | 54½–55½ | .. | 4 1 1 |
| 50,000 | 10 | 29 Aug. | 11½ | Bromley, Ordinary 10 p. c. | 22½–23½ | .. | 4 17 10 |
| 71,000 | 10 | " | 8½ | Do. 7 p. c. | 19–20 | .. | 4 5 0 |
| 500,000 | 10 | 14 Nov. | 4 | Buenos Ayres (New) Limited | 9½–9¾ | +½ | 4 2 0 |
| 200,000 | 100 | 2 Jan. | 6 | Do. 6 p. c. Deb. | 101–103 | .. | 5 16 7 |
| 150,000 | 20 | 11 July | 8½ | Cagliari, Limited | 30–32 | .. | 5 3 3 |
| 100,000 | 10 | 27 Sept. | 6 | Cape Town & District, Ltd. | 12½–13½ | .. | 4 8 10 |
| 50,000 | 50 | 2 Nov. | 6 | Do. 6 p. c. 1st Mort. | 56–58 | .. | 5 3 6 |
| 550,000 | Stck. | 16 Oct. | 13½ | Commercial Qld Stock | 328–333 | +1 | 4 1 1 |
| 165,000 | " | " | 10½ | Do. New do. | 257–262 | +1 | 4 0 3 |
| 165,000 | " | 16 Dec. | 4½ | Do. 4½ p. c. Deb. do. | 147–152 | .. | 2 19 2 |
| 800,000 | Stck. | 16 Dec. | 13 | Continental Union, Limited. | 270–275 | +3 | 4 14 6 |
| 200,000 | " | " | 10 | Do. 7 p. c. Pref. | 215–220 | +5 | 4 10 11 |
| 51,620 | Stck. | 29 Aug. | 14 | Croydon Com'cial A 10 p. c. | 280–285 | .. | 4 18 3 |
| 157,500 | " | " | 11 | Do. B 7 p. c. | 222–227 | .. | 4 16 11 |
| 535,000 | Stck. | 29 Aug. | 5½ | Crystal Palace Ord. 5 p.c. Stk | 130–135 | +3 | 3 17 9 |
| 60,000 | " | " | 5 | Do. 5 p. c. Pref. | — | .. | — |
| 486,090 | 10 | 30 Jan. | 11 | European, Limited | 26–27 | .. | 4 1 6 |
| 354,060 | 10 | " | 11 | Do. £7 10s. paid | 17–18 | .. | 4 14 3 |
| 5,746,590 | Stck. | 13 Feb. | 12¾ | Gaslight & Coke, A, Ordinary | 305–310* | +7 | 4 2 3 |
| 100,000 | " | " | 4 | Do. B, 4 p. c. max. | 105–110* | .. | 3 12 9 |
| 665,000 | " | " | 10 | Do. C, D, & E, 10 p.c. Pf. | 288–293* | .. | 3 8 3 |
| 30,000 | " | " | 5 | Do. F, 5 p. c. Prf. | 135–140* | .. | 3 11 5 |
| 60,000 | " | " | 7½ | Do. G, 7½ p. c. do. | 200–205* | .. | 3 13 2 |
| 1,300,000 | " | " | 7 | Do. H, 7 p. c. max. | 197–202* | +2 | 3 9 3 |
| 463,000 | " | " | 10 | Do. J, 10 p. c. Prf. | 285–290* | .. | 3 9 10 |
| 476,000 | " | " | 6 | Do. K, 6 p. c. Prf. | 163–172* | .. | 3 9 8 |
| 1,061,150 | " | 16 Dec. | 4 | Do. 4 p. c. Deb. Stk. | 137–140 | .. | 2 17 2 |
| 234,850 | " | " | 4½ | Do. 4½ p. c. do. | 148–153 | .. | 2 18 9 |
| 908,000 | " | " | 6 | Do. 6 p. c. do. | 204–209 | .. | 2 17 5 |
| 70,000 | 10 | 30 Oct. | 6 | Hongkong & China, Limited | 13–14 | .. | 4 5 8 |
| 3,800,000 | Stck. | 14 Nov. | 12 | Imperial Continental | 250–255 | +3 | 4 14 1 |
| 376,400 | 100 | 1 Feb. | 4 | Do. 4 p. c. Debs. Red. | 100–103 | .. | 3 17 8 |
| 473,600 | Stck. | 13 Feb. | 3½ | Do. 3½ p. c. Deb. Stk | 103–110* | +1 | 3 3 8 |

| Issue. | Share. | When Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p. c. | GAS COMPANIES. | | | £ s. d. |
| 75,000 | 5 | 16 Dec. | 6 | Malta & Mediterranean, Ltd. | 6–6½ | .. | 4 12 4 |
| 560,000 | 100 | 1 Oct. | 5 | Met. of Melbourne, 5 p. c. Deb. | 115–118 | +1 | 4 4 10 |
| 250,000 | 100 | " | 4½ | Do. 4½ p. c. Debs. | 103–110 | .. | 4 1 10 |
| 541,920 | 20 | 14 Nov. | 5 | Monte Video, Limited | 16–17 | .. | 5 17 8 |
| 150,000 | 5 | 28 Nov. | 8 | Oriental, Limited | 8½–8¾ | .. | 4 11 5 |
| 135,000 | 5 | " | 8 | Do. New, £4 10s. paid | 6¾–7¼ | .. | 4 19 4 |
| 15,000 | 5 | " | 8 | Do. do. 1879, £1 paid | 1½–2 | .. | 4 0 0 |
| 60,000 | 5 | 12 Sept. | 7 | Ottoman, Limited | 5–5½ | .. | 6 7 3 |
| 166,870 | 10 | 14 Feb. | 2 | Para, Limited | 1½–1¾ | .. | 11 8 6 |
| 420,000 | 100 | 2 Nov. | 6 | People's Gas 1st Mtg. Bds. | 105–110 | .. | 5 9 1 |
| 500,000 | 100 | 9 Dec. | 6 | of Chicago 2nd Do. | 103–105 | .. | 5 14 3 |
| 250,000 | 10 | 16 Oct. | 7 | San Paulo, Limited | 11¾–12½ | +½ | 5 12 0 |
| 500,000 | Stck. | 13 Feb. | 15½ | South Metropolitan, A Stock | 375–380* | .. | 4 1 7 |
| 1,350,000 | " | " | 12 | Do. B do. | 305–310* | .. | 3 17 5 |
| 310,000 | " | " | 13 | Do. C do. | 321–326* | .. | 3 19 9 |
| 800,000 | " | 16 Jan. | 5 | Do. 5 p. c. Deb. Stk. | 173–176 | .. | 2 16 10 |
| 60,000 | Stck. | 12 Sept. | 11½ | Tottenham & Edmonton, A | 250–255 | .. | 4 10 2 |
| 60,000 | " | " | 8½ | Do. B | — | .. | — |
| 170,383 | 10 | 30 Dec. | 10 | Tuscan, Limited | 13–14 | .. | 7 2 10 |
| 149,900 | 10 | 2 Jan. | 5 | Do. 5 p. c. Debs. Red. | 100–102 | .. | 4 18 9 |

WATER COMPANIES.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 746,021 | Stck. | 30 Dec. | 10½ | Chelsea, Ordinary | 312–317 | +7 | 3 4 8 |
| 150,000 | " | " | 5 | Do. 5 p. c. Pref. | 168–173 | .. | 2 17 9 |
| 160,000 | " | " | 4½ | Do. 4½ p. c. Pref. Stk., 1875 | — | .. | — |
| 175,785 | " | 27 Sept. | 4½ | Do. 4½ p. c. Deb. Stock | 155–160 | .. | 2 16 3 |
| 1,719,514 | Stck. | 16 Oct. | 7 | East London, Ordinary | 248–253 | +8 | 2 15 4 |
| 654,740 | " | 30 Dec. | 4½ | Do. 4½ p. c. Deb. Stk. | 155–160 | .. | 2 16 3 |
| 100,000 | " | " | 3 | Do. 3 p. c. Deb. Stk. | 105–107 | .. | 2 16 1 |
| 700,000 | 50 | 16 Dec. | 6½ | Grand Junction, 10 p.c. max. | 124–128 | +2 | 2 10 9 |
| 280,000 | Stck. | 27 Sept. | 4 | Do. 4 p. c. Deb. Stk. | 145–150 | .. | 2 13 4 |
| 708,000 | Stck. | 13 Feb. | 12 | Kent | 325–330* | +3 | 3 12 8 |
| 160,000 | " | " | 7 | Do. New, 7 p. c. max. | 205–210* | +3 | 3 6 8 |
| 1,013,820 | 100 | 30 Dec. | 7½ | Lambeth, 10 p. c. max. | 257–262 | +4 | 2 15 2 |
| 406,200 | 100 | " | 7½ | Do. 7½ p. c. max. | 212–217 | +2 | 3 6 11 |
| 330,000 | Stck. | 27 Sept. | 4 | Do. 4 p. c. Deb. Stk. | 145–150 | .. | 2 13 4 |
| 500,000 | 100 | 13 Feb. | 12¾ | New River, New Shares | 410–415* | +5 | 3 1 5 |
| 1,000,000 | Stck. | 30 Jan. | 4 | Do. 4 p. c. Deb. Stk. | 147–152 | +6 | 2 12 8 |
| 902,300 | Stck. | 16 Dec. | 6 | S'thwk & V'xhall, Ordinary | 162–166 | +6½ | 3 12 3 |
| 126,500 | 100 | " | 6 | Do. Do. 7½ p. c. Max. | 145–150 | +2 | 4 0 0 |
| 489,200 | Stck. | " | 5 | Do. Do. 5 p. c. Pref. | 168–173 | .. | 2 17 9 |
| 1,019,585 | " | — | 4 | Do. 4 p. c. A Deb. Stk. | 147–152 | +2 | 2 12 8 |
| 1,155,066 | Stck. | 16 Dec. | 10 | West Middlesex | 305–310 | +2 | 3 4 6 |
| 200,000 | " | " | 4½ | Do. 4½ p. c. Deb. Stk. | 155–160 | .. | 2 16 3 |

*Ex div.

# GWYNNE & BEALE'S
## PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

# GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

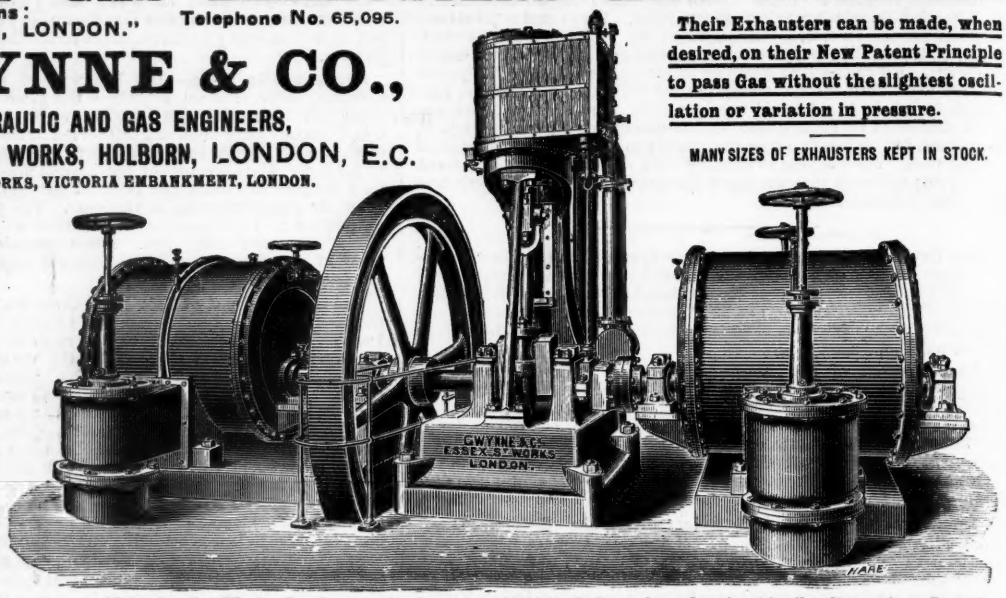
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.




Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.


**NOTICE TO ADVERTISERS.**—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.


GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works.

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

*Telegrams: "Volcanism, London."*

AMMONIACAL LIQUOR Wanted.

BROTHERTON AND Co., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

GAS TAR Wanted.

BROTHERTON AND Co., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.

BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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BROTHERTON AND Co., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.

JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 372, last week's issue.)

Telegrams: "HUTCHINSON BROS., BARNSLEY."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON,

Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.

*** See Advertisement p. II., centre of JOURNAL.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SULPHATE OF AMMONIA SATURATORS.

WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.

Please write for Estimate before ordering elsewhere.

PATENTS FOR INVENTIONS.

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Information and Handbook on application. 70, CHANCERY LANE, LONDON, W.C.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.

Head Office: MIDDLESBROUGH. Correspondence invited.

It is Worth Your While to Buy DIRECT.

THE RELIANCE LUBRICATING OIL COMPANY SUPPLY on APPROVAL "RELIANCE" NON-CORROSIVE LUBRICANTS (which, through their superiority, have the largest sale in the world)—viz., Engine, Cylinder, and Machinery Oils, 11½d.; Spindle Oil, 8½d.; Gas-Engine and Dynamo Oils, 1s. 6d. per gallon; Barrels Free and Carriage Paid. Also Liquids for Gas Making, Enriching, &c.

RELIANCE LUBRICATING OIL COMPANY, WATER LANE, GREAT TOWER, LONDON, E.C.

Depôts at Liverpool, Bristol, Hull, Glasgow, and Newcastle-on-Tyne. Telegrams: "Subastral, London."

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. Sample and Price on application.

OXIDE PAINTS, OILS, SULPHURIC ACID, &c. 120 and 121, NEWGATE STREET, LONDON, E.C.

Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c. CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.

Before placing Orders, please write for Estimate.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonization Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.

J. HARDMAN, Manufacturing Chemist. Milton, Staffs.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

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JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.

Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron.

Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.

READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

BACK-PRESSURE IN PURIFIERS.

**THE Valve invented by Mr. Cripps for** Bye-Passing any Layer of Purifying Material (referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

*In Paper Covers, Post Free 2s.*

**STEPHEN CARPENTER, of the Bow** Common Gas-Works, on the Purification of Coal Gas by Lime, Oxide of Iron, and Atmospheric Air, and the Method of Working Purifiers so that the Lime may be used a second time, with a description of Carpenter's short Method of working off the Sulphur Test and Table for calculating Results.

S. & H. W. CARPENTER, 3, Bedford Villas, Carshalton, SURREY.

TONBRIDGE GAS COMPANY.

**AN Exhibition of Gas Appliances, &c.,** will be opened at the Tonbridge Town Hall from March 18 to 21 inclusive.

APPLICATIONS for SPACE invited. Stove Space allotted.

Apply to JAMES DONALDSON, Secretary and Engineer.

**TO Engineers and Managers, wishing to** adopt the GENERATIVE or REGENERATIVE PRINCIPLES — Advertiser, having had 18 years' experience in Gaseous Firing, including the latest Improvements, is open to take any Work of the kind or the construction of Water-Gas Plants.

Address No. 2631, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**WANTED, Assistant Draughtsman for** Contractors' Office.

Apply, stating Age, Experience, and Salary, to No. 2633, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

**MANAGER wanted for Company holding** Patent for Gas Enrichment. Must be an able, energetic, Business Man, with some knowledge of Mechanics.

Apply "MANAGER," Wm. Porteous and Co., GLASGOW.

CARNARVON CORPORATION GAS-WORKS.

**WANTED, a thoroughly Practical Man** to undertake the MANAGEMENT of the above Works, which include Sulphate Making and Meter Testing.

Annual make, 21 Million Cubic Feet. Salary, £120. List of Duties may be had on application to the undersigned.

Applications, stating Age, Experience, and References, with three recent Testimonials, to be sent in by the 29th of February, addressed to the Chairman of the Gas Committee, Guildhall, Carnarvon, and endorsed "Gas Manager."

D. H. JONES,
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**WANTED, two 8 feet square Purifiers.** Usual depth; in good condition.

Address J. M. BAKER, Gorddinog, Llanfairfechan, NORTH WALES.

**TAR or Oil Railway Tank-Waggons,** Three Wanted. New or good Second-hand.

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**GAS Exhausters and Engines of** Improved Design, and of the very best Materials and Workmanship, always in stock or progress.

SELLERS PICKERING & Co., Gas Engineers, Ravensthorpe, YORKS.

**FOR SALE—Four Purifiers, 6 feet** Square by 3 feet deep, with Dry-Faced Centre-Valve and Connections, Lifting Apparatus, and Wrought-Iron Girders for same to travel on, complete. Also a 5-inch Dry-Faced FOUR-WAY VALVE.

Apply to GEORGE MOAT, Manager, Gas-Works, Purston, near PONTEFRACT.

PREPAYMENT METER.

BRITISH AND COLONIAL PATENT RIGHTS FOR SALE.

**THE Inventor is a practical Meter** Maker. The Mechanism is simple, strong, compact, and cannot be tampered with.

Full Particulars on application (by letter) to No. 2634, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RHYL URBAN DISTRICT COUNCIL GAS-WORKS.

**THE above Council have a Station** METER in Round Case, with 6-inch Connections and Cradle FOR SALE. The Meter is in good working order; and, owing to the rapid Extension of the Works, has had to be put on one side. Its capacity is 5000 Cubic Feet per hour.

Offers for same may be made to the undersigned.

LEONARD G. HALL,
Engineer and Manager.

Gas Office, Rhyl,
Feb. 21, 1896.

**FOR SALE—Four Purifiers, 8 feet** square 3 feet deep, with 8-inch Dry-Faced Centre-Valve and Connections; Wood Grids nearly new. 4000 feet per hour STATION METER, with Connections; New Drum four years since. Two small SCRUBBERS, Wrought Iron, with Six-Way Valve 100,000 feet LIVESEY WASHER, with 8-inch Valves and Connections. A FISON EXHAUSTER REGULATOR. Six-inch Self-Acting BYE-PASS VALVE. Two 8-inch Four-Way Dry-Faced BYE-PASS VALVES. Complete Set of IRONWORK for four Beds of six 15-inch Circular Retorts, including Mouthpieces, Ascension and Bridge Pipes, Separate Hydraulic Mains, fitted with Valves, &c.

Apply to HARRY WIMHURST, Gas-Works, SLEAFORD.

GAS PLANT, BUILDINGS,
AND
FREEHOLD LAND AT CARSHALTON, SURREY, FOR IMMEDIATE SALE.

**THE Croydon Commercial Gas and Coke** Company, having discontinued the Manufacture of Gas at their Works in Wrythe Lane, Carshalton, Surrey, have the following GAS PLANT, APPARATUS, BUILDINGS, and FREEHOLD LAND FOR SALE, viz.—

Retort-House and Coal-Store complete, with Wrought-Iron Roofs, six Beds of six Round Fire-Clay Retorts in each, 18 inches diameter by 9 ft. 3 in. long, and three Beds of similar new Retorts and Arches, and three Arches, complete, ready for Retorts.
Hydraulic Mains, Fittings, &c.
Battery Condenser, with 12-inch Valves, Connections, and Bye-Passes.
Horizontal Steam-Engine, Exhauster, and Exhauster Governor, complete.
Washer (Good's Patent), 8 feet diameter, with 12-inch Connections and Valves complete.
Washer, 12-inch, with 6-inch Connections and Valves complete.
Four Purifiers, 12 feet square, with Sieves and 12-inch Connections, Lifting Apparatus and Railway for same, complete.
Station Meter, 10,000 cubic feet per hour, with 12-inch Connections.
Gasholder (Single-Lift), 80 feet by 24 feet, with Brick Tank, Columns, Inlet and Outlet Valves complete, prepared for Telescoping.
Gasholder (Single-Lift), 60 feet by 16 feet, Standards, Brick Tank, &c.
Gasholder, 35 feet by 12 feet, Standards, Brick Tank, &c.
Governor, 6 inches diameter, with 6-inch Valves and Bye-Pass complete.
Governor, 12 inches diameter, with 12-inch Valves and Bye-Pass complete.
Evans Photometer, Clock, Gauges, &c., complete.
Three Large Cast-Iron Water-Tanks (above ground).
Liquor-Tank.
House and Offices, Engine and Boiler House, Meter-House, Lobby and Store-Room, Governor-House and Testing-Room, Purifying House and Shed, Smith's Shop.
Freehold Land, 3 acres, 0 roods, 37 perches (about 2 acres not built upon).

Orders to view the Plant and Works, and Particulars of Prices the Company require for the whole or any portion of the above, can be obtained on application to

W. J. RUSSELL,
Secretary.

Offices: Katharine Street, Croydon,
Jan. 18, 1896.

FOR SALE.

**ONE Single-Lift Gasholder, 50 feet** diameter, 20 feet deep, with Cast-Iron Tank, six Guide Columns, and Wrought-Iron Top Bracing.

One Single-Lift GASHOLDER, 16 feet diameter, 10 feet deep, with Cast-Iron Tank.

Two Vertical Multitubular Gas-Heated STEAM-BOILERS, 3 feet diameter by 18 feet high, with 25 3-inch Steel Tubes, suitable for a Working Pressure of 80 lbs., complete with Steam and Water Fittings.

One GAS-WASHER, 4 ft. by 4 ft. by 12 ft. high, and one SCRUBBER for Coke, 4 feet diameter by 12 feet high.

One Samuelson and Co.'s "O" size "ACME" EXHAUSTER and 14 in. by 14 in. DUPLEX ENGINE combined, having a capacity of about 10,000 cubic feet per minute.

This Plant has only worked a short time, and is almost new, having been erected within the last Six Years.

The above can be seen in Sheffield by appointment.

Applications or other correspondence addressed to No. 2636, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., will receive prompt attention.

GAS PLANT FOR IMMEDIATE SALE.

**THE Willenhall Gas Company, having** discontinued the Manufacture of Gas at their Works in Lower Lichfield Street, Willenhall, Staffordshire, have the following GAS PLANT for Sale, viz.—

TELESCOPIC GASHOLDER. Outer Lift, 45 ft. by 18 ft.; Inner Lift, 43 ft. by 18 ft. Cast-Iron Columns. Capacity, 53,390 Cubic Feet.
Two TELESCOPIC GASHOLDERS. Outer Lift, 60 ft. by 18 ft.; Inner Lift, 58 ft. by 18 ft. Cast-Iron Columns. Capacity of each, 94,425 Cubic Feet.
STATION METER, to pass 15,000 Cubic Feet per hour; 10-inch Connections. Hydraulic Valves by J. & J. Braddock.
WASHER (Kirkham, Hulett, and Chandler), to pass 250,000 Cubic Feet per day; 8-inch Connections.
ANNULAR CONDENSERS (Walker), to pass 250,000 Cubic Feet per day; 12-inch Connections.
GOVERNOR, 12 inches diameter, with 12-inch Connections, and Bye-Pass, by J. & J. Braddock.
Five Ton WEIGHBRIDGE; two EXHAUSTERS (by Jones), to pass 8000 Cubic Feet per hour; 15 by 16 inch MOUTHPIECES (Morton's Patent); ASCENSION-PIPES, &c.

For further Particulars, apply to J. C. Belton Manager.

A. MARSTON,
Secretary.

Gas Offices, Willenhall.

NUNEATON GAS COMPANY.

**TENDERS are invited for laying** 1100 yards of GAS-MAINS.

Particulars from the undersigned.

P. G. WINSTANLEY,
Engineer.

CLAYTON, ALLERTON, AND THORNTON GAS COMPANY.

**WANTED, Tenders for the supply and** erection of a TELESCOPIC GASHOLDER, 60 feet diameter, at the Wilsden Station of the above Company.

Drawings and Specification to be seen at the Company's Office, Clayton.

Tenders to be sent in on or before the 9th day of March, 1896.

By order,
JOHN NIVEN,
Secretary and Engineer.

Gas Office: Clayton, near Bradford,
Feb. 18, 1896.

TENDERS FOR GAS COAL, ETC.

**THE Directors of the Preston Gas Com-** pany are prepared to receive TENDERS for the supply of CANNEL and screened and unscreened GAS COAL for One, Three, or Five Years, from the 30th of June next.

Particulars may be obtained from the undersigned.

Tenders, stating class of Coal, District and Pit where raised, and Price, addressed to the Chairman of the Company, and endorsed "Tender for Coal, &c.," must be delivered on or before Wednesday, the 4th of March, 1896.

HENRY GREEN,
Secretary.

*Now Ready, Handsome Cloth, 9s. Post free,*

# GAS MANUFACTURE

## (THE CHEMISTRY OF);

A HANDBOOK ON THE PRODUCTION, PURIFICATION, AND TESTING OF ILLUMINATING GAS, AND THE ASSAY OF THE BYE-PRODUCTS OF GAS MANUFACTURE.

**For the Use of Students.**

BY W. J. ATKINSON BUTTERFIELD, M.A., F.C.S.,

Head Chemist, Gas-Works, Beckton, London, E.

*WITH NUMEROUS ILLUSTRATIONS.*

*** This work deals with the MOST MODERN DEVELOPMENTS of the subject; and the chapter treating of the BYE-PRODUCTS will be found of special interest.

**London: CHARLES GRIFFIN & Co., Ltd., Exeter Street, Strand.**

# ARROL-FOULIS
## Patent Automatic Machinery
FOR
# DRAWING AND CHARGING GAS-RETORTS.

**Full Particulars may be obtained from the Sole Makers,**

## SIR WILLIAM ARROL & CO., Limited,
## GLASGOW.

[See Illustrated Advertisement, Feb. 4, p. 211.]

SKELMERSDALE URBAN DISTRICT COUNCIL

**THE above Council invite Tenders for** the supplying and fixing of four PURIFIER LIDS and LUTES complete, particulars of which may be seen at the Offices any day between Nine and Ten a.m.

Tenders to be sent in on or before March 7 next.

WILLIAM CORNS,
Engineer and Surveyor.

---

BOROUGH OF BRIGHOUSE.

**THE Mayor, Aldermen, and Burgesses of** the Borough of Brighouse, acting by the Council, are prepared to receive TENDERS for the supply of the following Stores, viz.—FIRE-CLAY GOODS, IRONMONGERY, BRASS MAIN COCKS, NEW WET GAS-METERS, NEW DRY GAS-METERS, OIL, PAINTS, &c., STEEL GOODS, WROUGHT-IRON TUBES AND FITTINGS, WROUGHT-IRON GOODS, AND BRUSHES, required by the Gas Committee during the Year ending March 25, 1897.

Specification and Form of Tender can be obtained on application at the Gas Engineer's Office, Mill Lane Works, Brighouse.

Sealed tenders are to be sent in on or before Friday, Feb. 28, 1896, addressed to the Town Clerk, Public Offices, Brighouse.

The lowest or any tender not necessarily accepted.

By order,
JAMES PARKINSON,
Town Clerk.

Public Office Brighouse,
Feb. 11, 1896.

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TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

**NOTICE is Hereby Given, that the** HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 29th day of February inst., at Half-past Three o'clock in the Afternoon precisely, to receive the Report of the Directors, the Statement of Accounts for the Half Year ended the 31st of December, 1895, to declare a Dividend and to transact such other Business as the Act of Parliament directs.

The TRANSFER BOOKS WILL BE CLOSED from Saturday, the 15th inst., until Monday, the 2nd of March next.

By order of the Board of Directors,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
Feb. 14, 1896.

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OTTOMAN GAS COMPANY, LIMITED.

**NOTICE is Hereby Given, that the** ORDINARY MEETING of the Shareholders in the above Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, March 3, at One o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st day of December last, to declare a Dividend, to elect a Director and Auditors, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from Feb. 25 to March 3, both days inclusive.

By order of the Board,
THOMAS GUYATT,
Secretary.

9, Queen Street Place, Cannon Street,
London, E.C., Feb. 21, 1896.

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Gas Stocks and Shares in the Croydon Commercial Gas and Coke Company, West Ham Gas Company, Hampton Court Gas Company, Hornsey Gas Company, Barking Gas Company, Wandsworth and Putney Gaslight and Coke Company, Herne Bay Gas Company, Sunbury Gas Company, Enfield Gas Company, Chelmsford Gas and Coke Company, Southend Gas Company, Goring and Streatley Gas and Water Company.

**MR. ALFRED RICHARDS will Sell the** above BY AUCTION, at the Mart, E.C., on Monday, March 2, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

---

Second Portion of the Estate of the late William Halfhead, Esq.—Important Sale of Gas and Water Stocks and Shares.

- Gaslight and Coke Company—£450 Stock ("A" and "K").
- Commercial Gas Company—£520 Stock (Old and New, and Debenture).
- Hornsey Gas Company—£1230 Stock ("C," "B," and Preference).
- West Ham Gas Company—237 Shares and £700 Debenture Stock.
- Tottenham and Edmonton Gas Company—£460 Stock ("A" and "B").
- Lea Bridge Gas Company—15 Shares (Original).
- Romford Gas Company—47 Shares (Original and "B").
- West Kent Gas Company—44 Shares (Original and New).
- Worthing Gas Company—£200 Stock and 10 New Shares.
- Enfield Gas Company—£731 Stock (Preference and Debenture).
- North Camp and Farnborough Gas Company—20 Shares.
- Bournemouth Gas and Water Company—40 "B" Shares, £300 Debenture Bonds.
- Barnet District Gas and Water Company—£150 Stock, 20 "D" Shares.
- West Surrey Water Company—152 Ordinary and Preference Shares and £450 Debenture Stock.

All paying good Dividends and offering Investments of the highest character.

**MR. ALFRED RICHARDS will Sell** the above BY AUCTION, at the Mart, E.C., on Wednesday, March 18, at Two o'clock precisely, in lots.

Particulars of Messrs. LEWIS AND SONS, Solicitors, 7, WILMINGTON SQUARE, W.C., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C., and TOTTENHAM.

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BRIGHTON & HOVE GENERAL GAS COMPANY.

TO THE PROPRIETORS.

**NOTICE is Hereby Given, that the** ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, London, on Friday, the 13th of March, 1896, at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ending the 31st of December, 1895, to declare Dividends, to elect a Director, to appoint a special Auditor, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 29th of February to the 13th of March, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
London, E.C., Feb. 21, 1896.

---

BROMLEY GAS CONSUMERS' COMPANY.

**NOTICE is Hereby Given, that the** ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Thursday, the 27th day of February inst., at Six o'clock p.m. precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditors, to declare Dividends, and for General Purposes.

Notice is also given, that at such Meeting a RESOLUTION will be submitted for the creation of a further amount of DEBENTURE STOCK, and to authorize the issue thereof.

The TRANSFER BOOKS WILL BE CLOSED from the 13th to the 27th of February, 1896, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices at the Works: Bromley, Kent,
Feb. 12, 1896.

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BRISTOL WATER-WORKS COMPANY.

SALE OF STOCK.

**ALEXANDER, DANIEL, SELFE, & CO.** will SELL BY AUCTION, at the Bank Auction Mart, Corn Street, Bristol, on Thursday, the 5th day of March, at Two o'clock in the Afternoon,

**£15,000**

BRISTOL WATER-WORKS SEVEN PER CENT. MAXIMUM CONSOLIDATED ORDINARY STOCK, In convenient Lots of £100 Stock and upwards.

The Dividend on this Stock is subject to a Proportionate Diminution whenever the Maximum Dividend to which each Class of Ordinary Shares or Stock of the Company is entitled shall not be paid up in full; but such diminution may be made up in subsequent years.

For further Particulars and Conditions of Sale, apply to the AUCTIONEERS, Bank Chambers, Corn Street, BRISTOL (and 34, Old Jewry, London, E.C.); to Messrs. FUSSELL AND CO., Solicitors, 36, Corn Street, BRISTOL; or to the BRISTOL WATER-WORKS COMPANY, Small Street, BRISTOL.

---

# HOLMSIDE GAS COALS.

**PRESENT DAILY PRODUCE OVER 4000 TONS.**

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

# SOUTH MOOR PELTON GAS COALS.

**PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.**

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . $13\frac{1}{2}$ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·84 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor $94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COAL-FIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

**MR. MARK ARCHER,**
**HOLMSIDE AND SOUTH MOOR OFFICES,**
**NEWCASTLE-UPON-TYNE.**

---

# REPORTS OF GAS ASSOCIATIONS

— UNITED KINGDOM —

THIRTEENTH YEAR.

*Now Ready, Price 5s. 6d. each, Post Free,*

**THE COMPLETE REPORTS**
OF PROCEEDINGS OF THE
**DISTRICT ASSOCIATIONS of GAS MANAGERS FOR 1895.**

**The Twelve previous Volumes (for 1883 to 1894) are still on Sale. Price 5s. 6d. each, post free.**

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

---

# NEWBATTLE CANNEL.

**Highest Results in Gas, & Excellent Coke.**

QUOTATIONS ON APPLICATION TO

**THE LOTHIAN COAL COMPANY,**
LIMITED,
NEWBATTLE COLLIERIES,
**DALKEITH, N.B.**

---

# JUNKERS' CALORIMETER

SHOWS AT A GLANCE THE HEATING VALUE OF GAS.

NO BOMB. NO ANALYSIS.

See Illustrated Advertisement in the "JOURNAL" for Jan. 21, p. 147.

**Reduced Price £15 15s.**

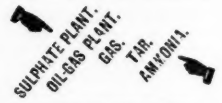
**HERMANN KÜHNE,**
**25-35, New Broad Street, London, E.C.**

---

ESTABLISHED 1862.

TRADE MARK.

**NEW GAS PLANT CEMENT**
For all Joints in connection with




SAMPLES ON APPLICATION.
SPECIAL PAINTS FOR GAS-WORKS.
*Telegrams "Enamel." Nat. Tel. 1759.*

**John E. Williams & Co.,** *Victoria Paint Works,* **Manchester.**

---

# BOLDON GAS COALS.

**Worked by THE HARTON COAL CO., LTD.**
**Output about 3000 tons per day.**

ANALYSIS—

| | | |
|---|---|---|
| Yield of Gas per ton . . | 10,500 | Cubic Feet. |
| Illuminating Power . . | 16·9 | Candles. |
| Coke . . . . . | 66·7 | Coke. |
| Sulphur . . . . . | 0·86 | Sulphur. |
| Ash . . . . . | 2·04 | Ash. |

**Boldon Gas Coals are supplied under contract to**

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

**For prices, &c., apply to the**

**HARTON COAL COMPANY,**
LIMITED,
**Newcastle-on-Tyne.**
W. H. PARKINSON,
FITTER.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

**CANNEL & COAL.**

TYNE

**BOGHEAD CANNEL.**

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

**EAST PONTOP GAS COAL.**

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

**SOUTH PELAW MAIN GAS COAL.**

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

*For Prices and complete Analysis, apply to*

**THOS. W. DANCE & SONS,**
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
**E. FOSTER & CO.,**
12, JOHN STREET, ADELPHI, LONDON, W.C.

## NOTICE.

Whereas it has come to the knowledge of the INCANDESCENT GAS-LIGHT COMPANY, Limited, of Palmer Street, Westminster, that a Company called the Meteor Incandescent Gas-Light Company, Limited, a firm known as Putz and Co., and a Company known as the Evening Sunlight Incandescent Light Company or the New Incandescent Light Company, are selling, and are offering for sale, forms of Incandescent Gas-Lights called respectively the "Meteor," the "Champion," and the "Evening Sunlight,"

THIS IS TO GIVE NOTICE, THAT THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, will commence ACTIONS FOR INFRINGEMENTS OF THEIR PATENTS against all persons found dealing in any manner with the said "Meteor," "Champion," or "Evening Sunlight" Incandescent Gas-Lights, which are all constructed in Infringement of the Patent of the Incandescent Gas-Light Company, Limited.

The validity of the Company's Patent has been certified by the Hon. Mr. Justice Romer.

FAITHFULL & OWEN,
11, Victoria Street, S.W.
Solicitors for the Incandescent Gas-Light Company, Limited.

## NOTICE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

> "The Incandescent Gas-Light Company, Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo*, Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—

> The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others*, the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas Light Company, Limited.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

## WARNING.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

WHEREAS, it has been brought to the notice of the INCANDESCENT GAS-LIGHT COMPANY, LIMITED, THAT DIVERS FIRMS UPON THE CONTINENT OF EUROPE are Manufacturing Incandescent Gas-Mantles, and are sending the same into this Country, and are advertising for Agents to push the sale of these Mantles,

THIS IS TO GIVE NOTICE, THAT ALL SUCH MANTLES ARE INFRINGEMENTS OF THE COMPANY'S PATENT, and that the Company will take proceedings for Infringement against all persons purchasing or using any of such Incandescent Gas-Mantles. THE COMPANY OWN THE MASTER PATENTS in this Country for the manufacture of Incandescent Gas-Mantles, and the validity of such Patents has already been certified by the Honourable Mr. Justice Romer, and the Company will enforce their Patent Rights against all Infringers.

FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.
11, Victoria Street, Westminster.

## NOTICE.

The attention of the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, having been again called to the Advertisements inserted in various papers by the Incandescent Gas-Light Company, Limited, of Palmer Street, Westminster, to the effect that the "Meteor" Incandescent Gas-Lights are an Infringement of their Patents, and that they will bring Actions for Infringement against all persons found dealing in any manner with such Lights, the METEOR INCANDESCENT LIGHTING COMPANY, LIMITED, HEREBY GIVE NOTICE that they are advised that the "Meteor" Incandescent Lights in no way infringe any of the Patents of the Incandescent Gas-Light Company, Limited, that an Action has been commenced to restrain such threats, and that they are PREPARED TO FULLY INDEMNIFY ALL PURCHASERS, DEALERS, AGENTS, and USERS of their Lights against any Legal Proceedings on the part of the Incandescent Gas-Light Company, Limited.

WILSON, BRISTOWS, & CARPMAEL,
1, Copthall Buildings, London, E.C.,
Solicitors to the Meteor Incandescent Lighting Company, Limited, of 35, New Broad Street, London, E.C.
*Nov.* 30, 1895.

LOW MOOR BLACK BED

**GAS COAL.**

YIELD OF GAS PER TON - 10,375 CUBIC FEET.
ILLUMINATING POWER - 17·50 SPERM CANDLES
COKE - - - - - - - - 75 PER CENT.

Prices, f.o.r. or f.o.b., on application to

**GEORGE & JOHN HAIGH,**
RAVENS LODGE AND CONYERS' COLLIERIES,
DEWSBURY.

A TRIAL IS RESPECTFULLY SOLICITED.

# THE WIGAN COAL & IRON CO., LIMTD.,

**Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.**

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

GASEOUS FIRING A SPECIALTY.

Telegraphic Address: "DRAKESON, HALIFAX"

GAS ENGINEERS.
RETORT SETTERS.
IRONFOUNDERS.

SOLE MAKERS OF
"MITTON'S"
PATENT SELF
-SEALING-
RETORT-LID.

JONAS DRAKE & SON

SOLE AGENTS
For
"HISLOP'S"
PATENT REGENERATIVE
FURNACES.
FOR ENGLAND, WALES & ABROAD.

OVENDEN, HALIFAX.

Telephone No. 43.
HALIFAX EXCHANGE.

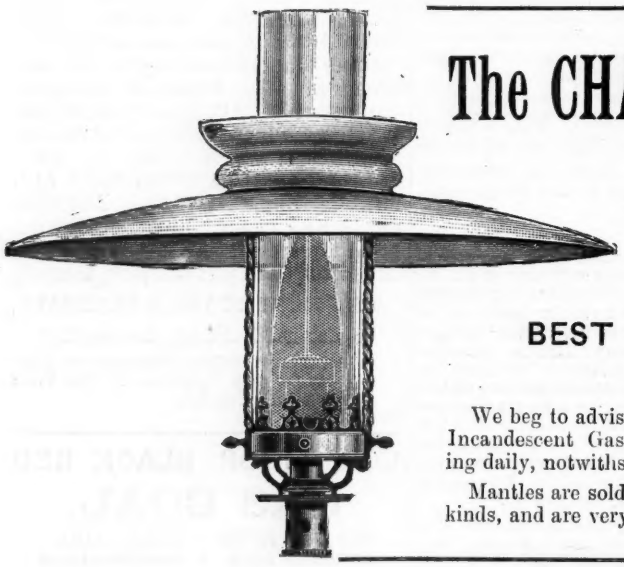
CONTRACTORS.
FURNACE BUILDERS.
&c. &c.

SOLE MAKERS OF
"SETTLE'S"
PATENT COMBINED
SEAL-REGULATING
FLUSH-VALVE.

LONDON OFFICE;
60. QUEEN VICTORIA ST., E.C.

# Special Notice

## TO GAS COMPANIES AND DISTRICT COUNCILS, ARCHITECTS, BUILDERS, AND CONTRACTORS.



## The CHAMPION INCANDESCENT GAS-BURNER.

BEST LIGHT AT LOWEST COST.

We beg to advise our numerous friends and customers that the Champion Incandescent Gas-Burner still holds the field, and that our sales are increasing daily, notwithstanding the threats of our competitors.

Mantles are sold in any quantity without restriction for use of particular kinds, and are very durable.

# F. J. PUTZ & CO.,

Temporary Premises: 16 & 17, GREAT ST. HELENS, LONDON, E.C.

*Telegraphic Address: "PUTZ, LONDON."*

**Several large Show-Rooms will shortly be opened in different Districts. All Agents and Buyers are fully indemnified against Law Proceedings. A few more Agents wanted in several Districts.**

## JAMES OAKES & Co.,

**ALFRETON IRON-WORKS, DERBYSHIRE,**

AND

**Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,**

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

## THORNLEY GAS COALS

WORKED BY THE

## WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

**Analysis made by**

**Messrs. J. & H. S. PATTINSON,** *May 28, 1895.*

| | |
|---|---|
| Yield of Gas per Ton . . | 10,500 Cub. Ft. |
| Illuminating Power . . | 16·9 Candles. |
| Coke (of good quality) . . | 67·5 per Cent. |
| Sulphur . . . . . | 0·58 ,, |
| Ash . . . . . | 2·73 ,, |

**For Price, &c., apply to the**

## WEARDALE IRON & COAL Co., Ld.

**QUAYSIDE, NEWCASTLE-ON-TYNE.**

## ROBERT MARSHALL,

**CANNEL COAL MERCHANT,**

97, WELLINGTON STREET, GLASGOW.

*Prices and Analysis of all the Scotch Cannels on Application.*

## TO ENGINEERS & MANAGERS.

ESTABLISHED OVER 50 YEARS.

This is to certify that I, SAMUEL NELSON, am the only ORIGINAL MAKER of the SOLID LEAD SATURATOR, or the CASED SATURATOR.

All Estimates given free for Lead Chemical Burning, and also Contracts for Sulphate Saturators.

**Note Address—**

**20, SPRING GARDENS, BOLTON, Lancashire.**

*Please write for Estimate before ordering elsewhere.*

## THOMAS TURTON AND SONS, LIMITED,

**SHEAF WORKS, SHEFFIELD,**

*MANUFACTURERS OF*

**FILES OF BEST QUALITY**

FOR ENGINEERS.

**STEEL OF ALL DESCRIPTIONS.**

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

**90, CANNON STREET, E.C.**

## HEBBURN MAIN GAS COALS.

| | |
|---|---|
| Yield of Gas per ton . . . . . | 10,500 cub. ft. |
| Illuminating Power . . . . . | 16·4 candles. |
| Coke . . . . . | 68 per cent. |

**For prices, f.o.b. Ship or Delivered by Rail, apply to**

**THE WALLSEND & HEBBURN COAL COMPANY, LTD.,**

**B Lombard Street, NEWCASTLE-ON-TYNE.**

**W. RICHARDSON, Fitter.**

## COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

***New Design, with two Cutting Rollers, making less Breeze than their old pattern.***

**GEORGE WALLER & CO.,**

PARK STREET, SOUTHWARK, E.C.,

*And at STROUD, GLOUCESTERSHIRE.*

## LONDONDERRY GAS COALS

FROM THE

## MARQUIS OF LONDONDERRY'S COLLIERIES,

**COUNTY OF DURHAM.**

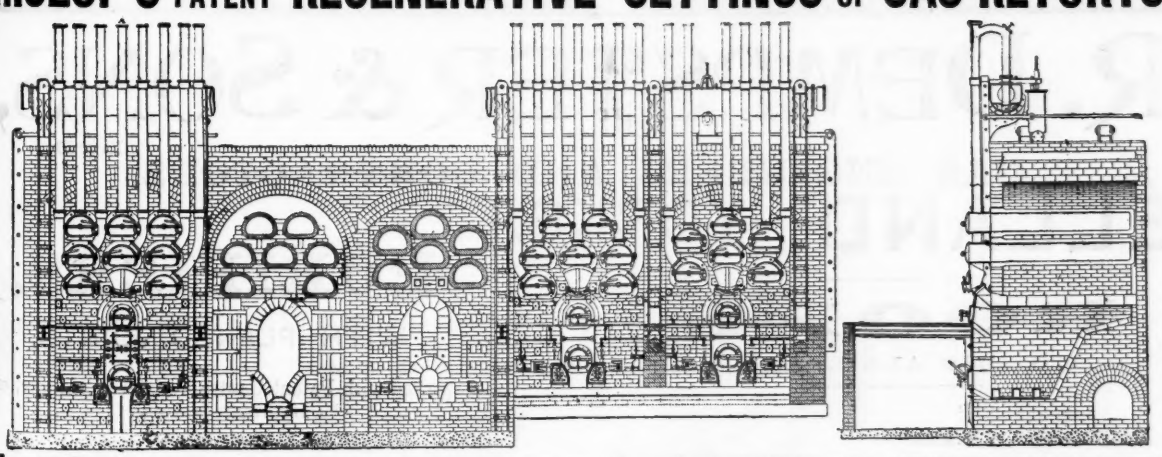
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

## S. J. DITCHFIELD,

**SEAHAM HARBOUR, COUNTY OF DURHAM.**

## HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON,** Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON,** Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

## HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

## SPENT LIMES NO LONGER WASTE PRODUCTS.

**Under G. R. HISLOP'S Patents all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.**

*Further Information and Pamphlets from Principal Agent.*

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
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Gas Companies are solicited to try Samples of the
**MIRFIELD**
BLACK BED GAS COAL.
*Prices and Analysis on application.*
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

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JAMES HUNTER, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.
This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.
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Established 1872.

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**GAS COOKING AND HEATING STOVES,**
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MAKERS OF **LEEDS**
**LARGEST GASHOLDER IN WORLD**
ALSO THE **LARGEST METAL TANK THE**
See Advertisement last week, also next week
MAKERS OF RETORT-LIDS OF ALL FORMS & SHAPES BY SPECIAL HYDRAULIC MACHINERY.

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**GAS ENGINEERS AND CONTRACTORS, LTD.,**
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**ROOFS**
TO SUIT ALL SPANS.

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**PURIFIERS,**
WITH PLANED JOINTS,
Worked with Patent Centre Four-Way, Single, or Hydraulic Valves.

LIFTING APPARATUS OF ALL DESIGNS.

Wood Grids of best finish.

From a Photograph of Six Purifiers and Superstructure, the whole of which were erected by us.

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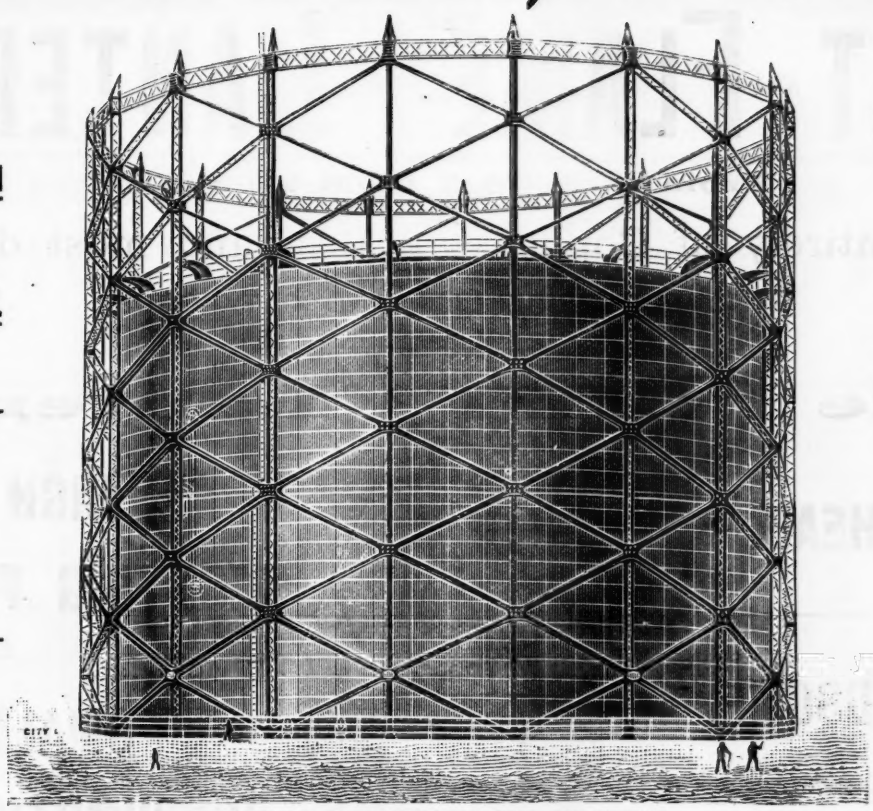
BEST POSSIBLE DISPOSITION OF MATERIALS.

SAFE.

CHEAP.



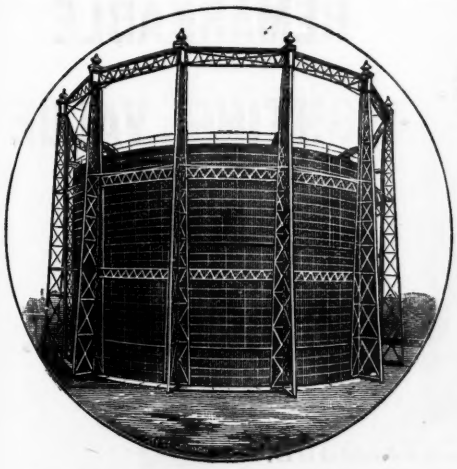
SAVING IN COST OF TANK AS No Piers ARE Required.

CUTLER'S PATENT GUIDE-FRAMING.

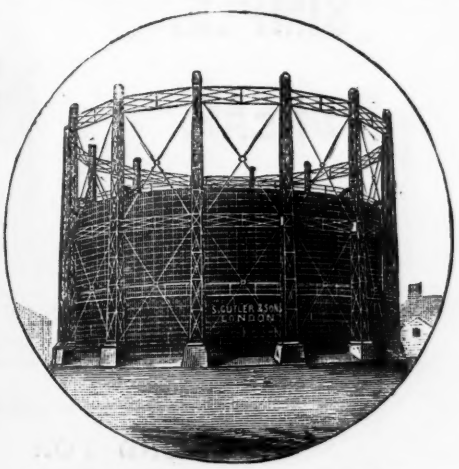
## GASHOLDERS OF EVERY DESCRIPTION.

THE FOLLOWING ARE A FEW EXAMPLES OF LARGE HOLDERS RECENTLY ERECTED—

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Kensal Green . | 3-lift | 247 by 55 | Nottingham (2) | 2-lift | 180 by 38 | Amsterdam (2) . | 3-lift | 150 by 25 |
| Bethnal Green . | 3-lift | 197 „ 50 | Do. . . | 2-lift | 160 „ 37 | West Ham . . . | 2-lift | 150 „ 36 |
| Birmingham (2) | 3-lift | 236 „ 50 | Copenhagen. . | 3-lift | 175 „ 30 | Derby . . . . . | 2-lift | 140 „ 26 |
| Vienna . . . | 3-lift | 204 „ 41 | Hull . . . . | 3-lift | 160 „ 37 | Rochdale. . . . | 4-lift | 150 „ 34 |
| Dublin . . . | 2-lift | 201 „ 40 | Portsea . . . | 3-lift | 158 „ 30 | Tottenham . . . | 3-lift | 150 „ 32 |
| Berlin. . . . | 3-lift | 181 „ 35 | Hanover . . . | 3-lift | 154 „ 38 | Sunderland . . . | 3-lift | 150 „ 32 |



## STEEL TANKS FOR GASHOLDERS.



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**Designs and Estimates upon Application.**

# BRAY'S
# FLAT-FLAME LANTERNS

**From 30 to 800 Candle Power.**

Made entirely of Copper. Best and most durable.

SEND FOR PRICE LIST AND CATALOGUE.

## The "CITY" Lantern.

CHEAP.

HANDSOME.

WELL MADE.

HIGH LIGHTING POWER.

SMALL CONSUMPTION OF GAS.

## THE "BRAY" REFLECTING LIGHT.

SIMPLE.

CHEAP.

EFFICIENT.

ECONOMICAL.

REMARKABLE LIGHTING VALUE FOR GAS CONSUMED.

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**GEO. BRAY & CO., GAS-LIGHTING ENGINEERS, LEEDS.**

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

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**Have constructed their EUROPEAN type of**

## CARBURETTED WATER-GAS PLANT

**At the following Gas-Works:—**

| | | | |
|---|---|---|---|
| Copenhagen | 700,000 Cub. Ft. | Brussels | 700,000 Cub. Ft. |
| Belfast | 1,700,000 ,, | Liverpool | 2,500,000 ,, |
| Glasgow | 300,000 ,, | Tottenham | 600,000 ,, |
| Santiago | 400,000 ,, | Brighton | 1,250,000 ,, |
| Swansea | 700,000 ,, | Bath | 1,000,000 ,, |

**And have now under Contract:—**

| | | | |
|---|---|---|---|
| Belfast (Second Contract) | 3,500,000 Cub. Ft. | Manchester | 3,000,000 Cub. Ft. |
| Preston | 1,500,000 ,, | New York | 1,000,000 ,, |
| Southport | 750,000 ,, | Newburgh, N.Y. | 350,000 ,, |
| Tottenham (Second Contract) | 750,000 ,, | St. Joseph, Mo. | 750,000 ,, |

**In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.**

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## ALDWARKE MAIN GAS COAL

**Analysis: 12,600 feet of 19-candle gas per ton.**
**Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.**
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**PAINTS FOR GAS-WORKS.** **PAINTS FOR GASHOLDERS.**

**Contractors to Her Majesty's Government, the Indian Government, the Natal Government, the Turkish Government, the Netherlands Railway, the London County Council, &c., &c.**

# CROSBIE'S PAINTS.

**Guaranteed genuine and free from adulteration, and specially made to withstand Gaseous Fumes.**

**Catalogue and Testimonials on Application.**

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SPECIALITIES: Incandescent Lamp Burners and Mantles (with or without electric lighting from any distance, by button from the wall, etc.).

*INCANDESCENT SPIRIT LAMPS.*

**Electro-technical Ware of all kinds.**

**IMPORT and EXPORT.**

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**BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.**

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## RETORTS AND FIRE-BRICKS.

**BEST QUALITY.**

## KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, Feb. 4, p. 248.]

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## OXIDE OF IRON.

NATURAL BOG ORE FROM OWN MINES.

Samples and Prices on application.

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**AND ALL KINDS OF GAS-WORKS APPARATUS.**

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

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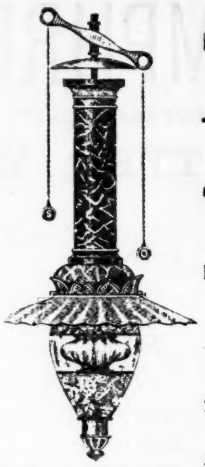

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**A 280-CANDLE POWER PLAIN IRON LAMP,**

CLASS A– **55/-**

**LIGHT for LIGHT**

less than half the price of any other Regenerative Lamp.

Manufactured in England.

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and Manufacturers of every description of

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Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

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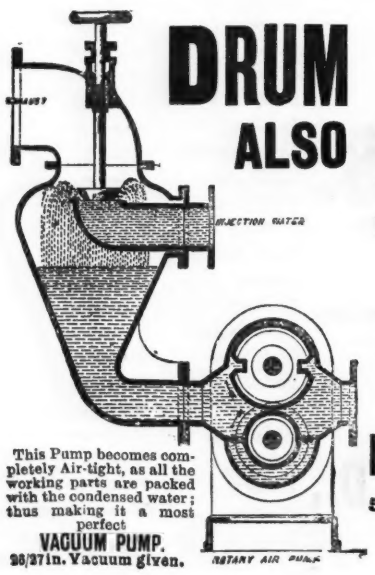
**"The Force of the Piston Pump with the Capacity of the Centrifugal combined."**

**JOHNSON'S PATENT**

## DRUM PUMP AND EXHAUSTER

## ALSO VACUUM PUMP AND CONDENSER.




This Pump becomes completely Air-tight, as all the working parts are packed with the condensed water; thus making it a most perfect

**VACUUM PUMP.**

28/27in. Vacuum given.

**No Priming, Valves, or Frictional Working Parts.**

The Pump of the future for quickly and economically moving large Bodies of Water, Semi-fluid, &c.

## DRUM ENGINEERING Co.

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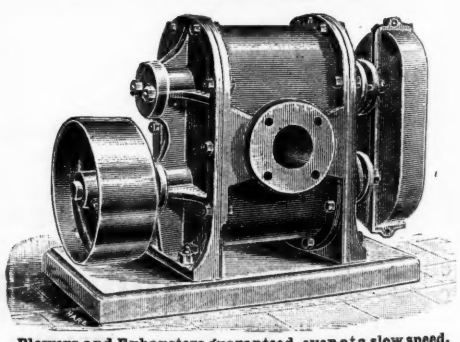

**Blowers and Exhausters guaranteed, even at a slow speed, to give a working pressure of 3 lbs. and upwards, and this without losing power by creating frictional Heat.**

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**BEST FIRE-BRICKS, GAS-RETORTS,**

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

**Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.**

# GODDARD, MASSEY, & WARNER'S

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## Sulphate of Ammonia Apparatus.

**The most successful and approved Apparatus known up to the present time.**

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## ENGINEERS,
## NOTTINGHAM.

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**And to the following Gas Companies and Corporations—**

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| ILKESTON. | BURY. | CHORLEY. |
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| DENTON. | SOWERBY BRIDGE. | LEEK. |
| ST. ALBANS. | LEICESTER. | IPSWICH. |
| DUKINFIELD. | DARWEN. | BOURNEMOUTH. |
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## The Oil Gas Enrichment Company's Patents.

This Process for Enriching Coal Gas has now been adopted by nearly **50** Gas-Works at Home and Abroad, and continues to give complete satisfaction.

VERY LARGE PROFITS HAVE ACCRUED AT GAS-WORKS WHERE IT IS IN OPERATION; AND THE TROUBLE ARISING FROM NAPHTHALENE DEPOSITS HAS BEEN REMOVED.

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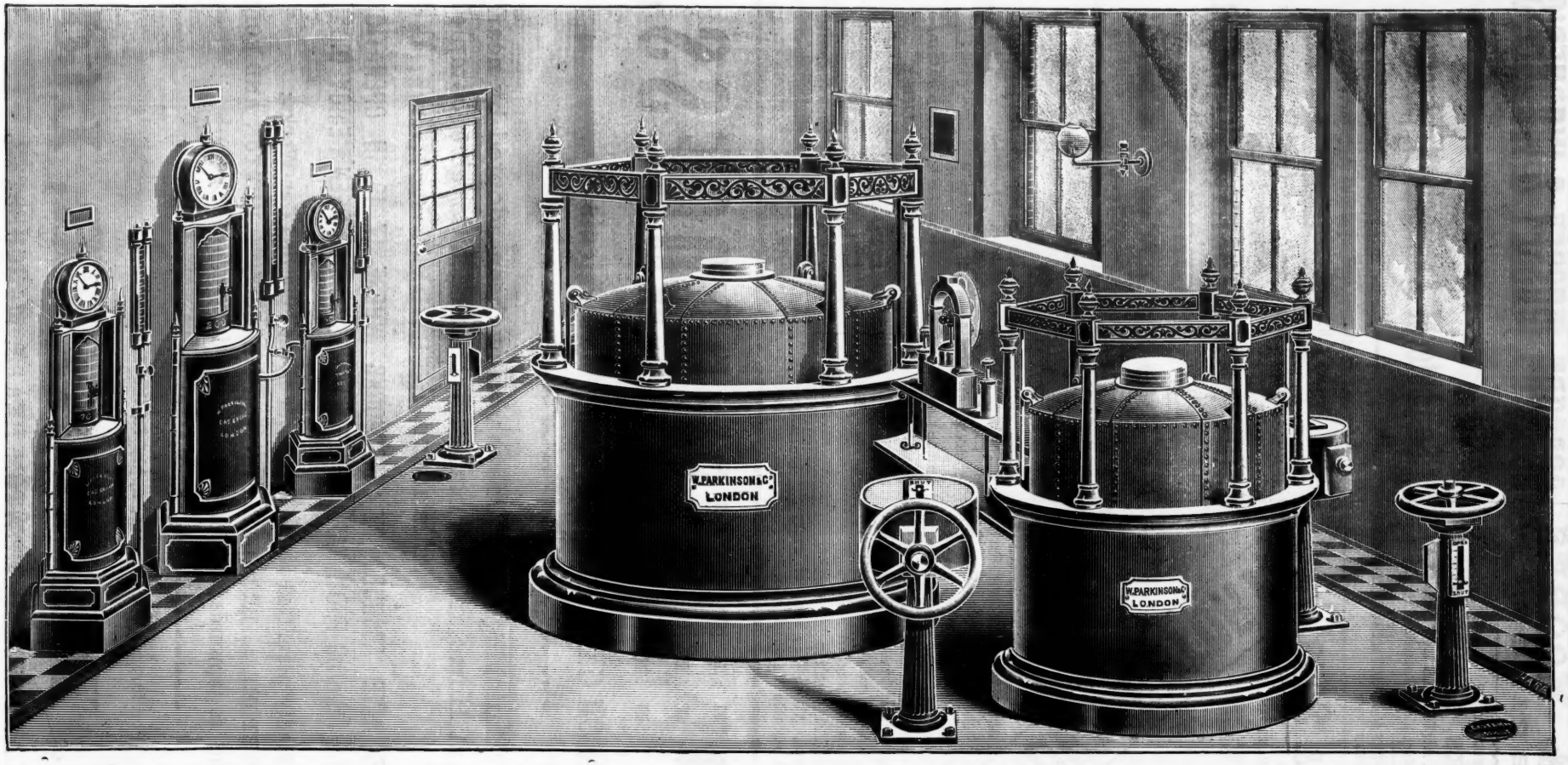
GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

*** **Please note that our Advertisements will in future regularly appear in this space—viz., the inside of the last leaf of the JOURNAL—to facilitate reference by our customers.**




## EQUILIBRIUM GOVERNORS. THE GASLIGHT AND COKE COMPANY'S VALVE-ROOM, STOKE NEWINGTON.

**(TESTIMONIAL.)**

THE GASLIGHT AND COKE COMPANY, 146, *Goswell Road, E.C., Jan.* 5, 1893.

GENTLEMEN,—In reply to your inquiry as to the working of the 36-inch and 24-inch Governors (double cone and equilibrium) recently erected by you at the new Valve-Station of this Company, situated at Stoke Newington, I beg to inform you they are highly satisfactory in their working.

The gas governed is supplied through a high-pressure pumping-main; and, notwithstanding the great fluctuations in the initial pressure, owing to so many stations pumping and shutting off alternately, the construction of your Governors enables a perfect equilibrium to be maintained, and being acted upon themselves by outlet pressure only, they stand the most severe test to perfection.

I shall be happy to answer any questions, or show the Governors to Engineers contemplating their erection.

Messrs. W. PARKINSON AND Co.,
Cottage Lane, City Road, E.C.

I am, Gentlemen, Yours faithfully,
(Signed) G. F. L. FOULGER, *Distributing Engineer.*

**W. PARKINSON & CO.,** LONDON, BIRMINGHAM.

[See also Advt., p. 386.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Feb. 25, 1896.